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# A Review of the V50 Ballistic Limit Requirements of MIL-A-46100

Robert C. Grubinskas

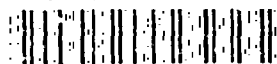
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# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

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## A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

### Objectives

The objectives of this memorandum report are twofold:

- \* To provide the analyst with the various revisions and amendments of the  $V_{50}$  ballistic limit requirements of MIL-A-46100 for the purpose of making easier and more accurate analyses and comparisons of  $V_{50}$  firing record data.

- \* To furnish the reader with useful technical information extracted from the various revisions and amendments of MIL-A-46100 pertaining to its  $V_{50}$  ballistic test requirements.

### Introduction

MIL-A-46100<sup>1</sup> is a Military Specification which covers quenched and tempered high-hardness wrought steel armor plate of thicknesses up to two (2) inches inclusive for use in lightweight armor applications. This memorandum report is a by-product of that portion of an ongoing project entitled *Improved High Hard Armor Steel (MIL-A-46100)* which involves the creation of a computerized Armor Steel Database for the storage and analysis of ballistic test data obtained on MIL-A-46100 steel by the U.S. Army Combat Systems Test Activity (CSTA).<sup>2</sup> The CSTA-furnished ballistic test results spanned the following three (3) MIL-A-46100 Revisions: Revision C, Revision C Amendment 2 (hereafter to be denoted as Revision C2), and Revision D. As the Armor Steel Database was being populated, it was observed that the required ballistic limit velocities (the minimum ballistic acceptance requirements) associated with each of these specification revisions do vary rather significantly. As a consequence of this observation, a complete review of the various revisions and amendments of MIL-A-46100 was undertaken to insure that the specification-revision-dependent results of the ballistic tests being analyzed are, indeed, accurately interpreted and unambiguously compared. This memorandum report presents the salient aspects of this review wherein the differences between the ballistic test requirements of these recent revisions of MIL-A-46100 are appropriately highlighted and documented in a single reference source.

### Discussion

Military Specification MIL-A-46100 was initiated in 1965 to respond to a then critical need for armor plate in Southeast Asia. Since its implementation on 4 August 1965 - the introductory document being referred to as the **BASE** - this specification has undergone a series of revisions and amendments. The ballistic test requirements were originally classified CONFIDENTIAL and incorporated into a separate classified supplement. Subsequently, as of Revision A, Amendment 2, dated 9 May 1975, the ballistic test

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requirements were declassified and embodied in an unclassified appendix as an attachment to the specification document. The historical development of this military specification from its inception to present is shown in Table 1.

The overall two (2) inch armor plate thickness range covered by MIL-A-46100 is divided into either four (4) or five (5) subordinate thickness ranges depending upon the applicable specification revision - **four (4) thickness ranges** from the **Base** document through Revision C inclusive, and **five (5) thickness ranges** from Revisions C2 through D1 inclusive. Associated with **each** subordinate thickness range is a specified armor-piercing (AP) **test projectile** and **target obliquity**. This armor plate thickness range partitioning is delineated in Table 2 for MIL-A-46100 Revisions C Amendment 2 and D.

In order to accommodate permissible production-related plate thickness variations in ordered MIL-A-46100 armor plate material, each subordinate thickness range is further subdivided into three (3) component thickness ranges; namely, **UNDERSIZE**, **REQUIRED**, and **OVERSIZE**. The specification's ballistic test requirements **begin** at the **lower boundary** of the **REQUIRED** thickness range and **end** at its **upper boundary**. The **UNDERSIZE** and **OVERSIZE** thickness ranges permit the application of the ballistic test requirements to undersize and oversize plate thicknesses. These three (3) component thickness provisions are included in Tables 3, 4, and 5 for MIL-A-46100 Revisions C, C2, and D respectively. In referring to these tables, it should be noted that Revision C includes only **four (4)** test projectiles. The **fifth** test projectile was added with the issuance of Revision C2 to extend the ballistic test requirements for armor plate to include thicknesses of up to two (2) inches.

The minimum required  $V_{50}$  protection ballistic limit, **BL(P)**, velocity values in the MIL-A-46100 Appendix "Armor Plate Thickness - Required BL(P)" Tables are computed using mathematical models developed by the U.S. Army Combat Systems Test Activity. The quantity " $V_{50}$ " will be used synonymously with "**BL(P)**" in this memorandum report to denote the minimum required  $V_{50}$  protection ballistic limit velocity expressed in units of [FT/SEC]. In these mathematical models, the dependent variable,  $V_{50}$ , is expressed as a function of armor plate thickness expressed in units of [INCHES] and denoted by the symbol  $t$  in this memorandum report. Also, the notation P1, P2, P3, P4, and P5 shall be used to represent MIL-A-46100's five (5) test projectiles. A mathematical model exists for each test projectile, target obliquity, and specification revision. See Table 6.

## A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

The following **implicit** functional notation can be used to mathematically describe this **set** of mathematical models:

$$V_{50}(\text{PROJ}, \text{OBL}, \text{revR})$$

where PROJ = P1: CAL 0.30 AP M2 or  
P2: CAL 0.50 AP M2 or  
P3: 14.5 MM API B32 or  
P4: 14.5 MM API BS 41 or  
P5: 20 MM API-T M602;  
OBL = target obliquity =  $0^\circ$  or  $30^\circ$ ; and  
R = specification revision = C or C2 or D.

This implicit functional notation is employed in Table 6 to illustrate the dependencies of the computed  $V_{50}$  Protection Limit Velocities upon MIL-A-46100 Specification Revisions C, C2, and D. In the examination of this Table, it should be noted that a **new** set of five (5) mathematical models were introduced in Revision C2. Consequently, if any reference is to be **unambiguously** made for the satisfaction of the ballistic testing requirements of MIL-A-46100 Revision C, it is important to distinguish Revision C from Revision C2! In contrast, for Revision D, **only** one (1) new mathematical model was introduced for test projectile P5. For Revision D, the current MIL-A-46100 Revision, the mathematical models for the first four (4) test projectiles are the **same** as Revision C2. Prior to Revision D, the same set of four (4) mathematical models had been used from the **BASE** document through Revision C inclusive.

Table 7 shows the ballistic test requirements for each of the five (5) test projectiles in terms of specification revisions, armor plate thickness ranges, mathematical models, and security classifications. The contents of this table provides a compact historical overview of the ballistic test requirements of MIL-A-46100.

Table 8 includes the empirical equations used to compute the minimum required  $V_{50}$  ballistic velocities for test projectiles P1 (CAL 0.30 AP M2), P2 (CAL 0.50 AP M2), and P3 (14.5 MM API B32) for MIL-A-46100 Revision C. Similarly, in Table 9, are shown the empirical equations used to compute the remainder of the minimum required  $V_{50}$  ballistic velocities for MIL-A-46100 Revisions C, C2, and D.

Tables of the minimum required  $V_{50}$  protection ballistic limits (BL(P)'s), as a function of the five (5) test projectiles for MIL-A-46100 Revisions C, C2, and D are given as Tables 10-14 inclusive. In each table, the REQUIRED thickness- $V_{50}$  values are highlighted in **bold face type**. Table 15 contains a listing of the number of individual pages comprising Tables 10-14.

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Finally, the data contained in Tables 10-14 forms the basis for the generation of a set of three (3) curves for each of the five (5) test projectiles. In these plots, the armor plate thickness range inclusively spans the UNDERSIZE, REQUIRED, and OVERSIZE component thickness ranges. For Projectiles P1, P2, P3, and P4, the three (3) curves are:

1. Minimum  $V_{50}$  Velocity versus Armor Plate Thickness for Revision C and Revision C2
  - \* (Revision C2  $V_{50}$ 's = Revision D  $V_{50}$ 's)
2.  $V_{50}$  Velocity Differences versus Armor Plate Thickness
  - \* ( $V_{50}$  Difference (Revision C2 - Revision C))
  - \* (Revision C2  $V_{50}$ 's = Revision D  $V_{50}$ 's)
3. Curves 1 & 2 Combined

For Projectile P5, the three (3) curves are:

1. Minimum  $V_{50}$  Velocity versus Armor Plate Thickness for Revision C2 and Revision D
2.  $V_{50}$  Velocity Differences versus Armor Plate Thickness
  - \* ( $V_{50}$  Difference (Revision D - Revision C2))
3. Curves 1 & 2 Combined

Regarding the  $V_{50}$  Velocity Differences versus Armor Plate Thickness curves (Curve 2), the velocity differences vary non-linearly with armor plate thickness for test projectiles P1 and P2, while the velocity differences are almost constant for test projectiles P3, P4, and P5 over the armor plate thickness range. For the latter case, the curve resembles a scatter plot wherein the data points fall within a narrow velocity difference band.

# **A REVIEW OF THE V<sub>50</sub> BALLISTIC TEST REQUIREMENTS OF MIL-A-46100**

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### **CSTA**

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### **CONTRACTORS**

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## **References**

1. Military Specification MIL-A-46100.
2. Grubinskas, Robert C. and Squillacioti, Richard J. The Development of an Automated Armor Data Base - Phase 1. U.S. Army Research Laboratory, ARL-TR-218, September 1993.

# A REVIEW OF THE V<sub>50</sub> BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 1

| MIL SPEC MIL-A-46100 HISTORY |                    |                  |                       |
|------------------------------|--------------------|------------------|-----------------------|
| SPEC REVISION                | SPEC REVISION DATE | AMENDMENT NUMBER | AMENDMENT NUMBER DATE |
| BASE                         | 04 AUG 65          |                  |                       |
| A                            | 09 AUG 72          |                  |                       |
| A                            |                    | 1                | 06 NOV 72             |
| A                            |                    | 2                | 09 MAY 75             |
| B                            | 29 JUL 77          |                  |                       |
| C                            | 13 JUN 83          |                  |                       |
| C                            |                    | 1                | 15 NOV 84             |
| C                            |                    | 2                | 20 OCT 86             |
| D                            | 16 MAY 88          |                  |                       |
| D                            |                    | 1                | 29 JUN 90             |

TABLE 2

| MIL SPEC MIL-A-46100 REVISIONS C AND 2 & D<br>TABLE OF REQUIRED ARMOR PLATE THICKNESS RANGES<br>AS A FUNCTION OF PROJECTILE CALIBER |                        |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------------|
| PROJECTILE<br>[CALIBER]                                                                                                             | OBLIQUITY<br>[DEGREES] | REQUIRED THICKNESS<br>RANGE<br>[INCHES] |
| CAL 0.30 AP M2                                                                                                                      | 30                     | 0.125-0.315                             |
| CAL 0.50 AP M2                                                                                                                      | 30                     | 0.316-0.590                             |
| 14.5 MM API B32                                                                                                                     | 30                     | 0.591-0.765                             |
| 14.5 MM API BS41                                                                                                                    | 30                     | 0.766-1.065                             |
| 20 MM API-T M602                                                                                                                    | 0                      | 1.066-2.100                             |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLES 3, 4, & 5

| MIL SPEC MIL-A-46100 REVISION C                     |                    |                   |                   |
|-----------------------------------------------------|--------------------|-------------------|-------------------|
| TABLE OF REQUIRED ARMOR PLATE THICKNESS RANGES [IN] |                    |                   |                   |
| PROJECTILE, OBL                                     | UNDERSIZE<br>RANGE | REQUIRED<br>RANGE | OVERSIZE<br>RANGE |
| 0.30 CAL AP M2, 30°                                 | 0.102-0.120        | 0.125-0.300       | 0.305-0.340       |
| 0.50 CAL AP M2, 30°                                 | 0.275-0.300        | 0.301-0.590       | 0.595-0.625       |
| 14.5 MM API B32, 30°                                | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       |
| 14.5 MM API BS41, 30°                               | 0.740-0.765        | 0.766-1.065       | 1.070-1.090       |

| MIL SPEC MIL-A-46100 REVISION C AMENDMENT 2         |                    |                   |                   |
|-----------------------------------------------------|--------------------|-------------------|-------------------|
| TABLE OF REQUIRED ARMOR PLATE THICKNESS RANGES [IN] |                    |                   |                   |
| PROJECTILE, OBL                                     | UNDERSIZE<br>RANGE | REQUIRED<br>RANGE | OVERSIZE<br>RANGE |
| CAL 0.30 AP M2, 30°                                 | 0.100-0.120        | 0.125-0.315       | 0.320-0.340       |
| CAL 0.50 AP M2, 30°                                 | 0.290-0.315        | 0.316-0.590       | 0.595-0.625       |
| 14.5 MM API B32, 30°                                | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       |
| 14.5 MM API BS41, 30°                               | 0.740-0.765        | 0.766-1.065       | 1.070-1.090       |
| 20 MM API-T M602, 0°                                | 1.020-1.065        | 1.066-2.100       | 2.105-2.175       |

| MIL SPEC MIL-A-46100 REVISION D                     |                    |                   |                   |
|-----------------------------------------------------|--------------------|-------------------|-------------------|
| TABLE OF REQUIRED ARMOR PLATE THICKNESS RANGES [IN] |                    |                   |                   |
| PROJECTILE, OBL                                     | UNDERSIZE<br>RANGE | REQUIRED<br>RANGE | OVERSIZE<br>RANGE |
| CAL 0.30 AP M2, 30°                                 | 0.100-0.120        | 0.125-0.315       | 0.320-0.340       |
| CAL 0.50 AP M2, 30°                                 | 0.290-0.315        | 0.316-0.590       | 0.595-0.625       |
| 14.5 MM API B32, 30°                                | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       |
| 14.5 MM API BS41, 30°                               | 0.740-0.765        | 0.766-1.065       | 1.070-1.090       |
| 20 MM API-T M602, 0°                                | 1.020-1.065        | 1.066-2.100       | 2.105-2.175       |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 6

| MIL SPEC MIL-A-46100                                      |                                     |                                      |                                      |
|-----------------------------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| $V_{50}$ PROTECTION BALLISTIC LIMIT VELOCITY DEPENDENCIES |                                     |                                      |                                      |
| UPON SPEC REVISIONS                                       |                                     |                                      |                                      |
| PROJECTILE                                                | SPECIFICATION REVISIONS             |                                      |                                      |
|                                                           | REV C                               | REV C<br>AMD 2                       | REV D                                |
| P1: CAL 0.30 AP M2                                        | $V_{50}(P1, 30^\circ, \text{revC})$ | $V_{50}(P1, 30^\circ, \text{revC2})$ | $V_{50}(P1, 30^\circ, \text{revC2})$ |
| P2: CAL 0.50 AP M2                                        | $V_{50}(P2, 30^\circ, \text{revC})$ | $V_{50}(P2, 30^\circ, \text{revC2})$ | $V_{50}(P2, 30^\circ, \text{revC2})$ |
| P3: 14.5 MM API B32                                       | $V_{50}(P3, 30^\circ, \text{revC})$ | $V_{50}(P3, 30^\circ, \text{revC2})$ | $V_{50}(P3, 30^\circ, \text{revC2})$ |
| P4: 14.5 MM API BS41                                      | $V_{50}(P4, 30^\circ, \text{revC})$ | $V_{50}(P4, 30^\circ, \text{revC2})$ | $V_{50}(P4, 30^\circ, \text{revC2})$ |
| P5: 20 MM API-T M602                                      | -                                   | $V_{50}(P5, 0^\circ, \text{revC2})$  | $V_{50}(P5, 0^\circ, \text{revD})$   |

# A REVIEW OF THE V<sub>50</sub> BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 7

MIL-A-46100 REVISIONS  
ARMOR PLATE THICKNESS RANGES [INCHES]  
V<sub>50</sub> BALLISTIC LIMIT VELOCITY MATH MODELS  
SECURITY CLASSIFICATIONS

## PROJECTILE P1: CAL 0.30 AP M2 @ 30 DEG OBLIQUITY

| SPEC REVISION | UNDERSIZE TH RANGE | REQUIRED TH RANGE | OVERSIZE TH RANGE | MATH MODEL                     | SEC CLASS |
|---------------|--------------------|-------------------|-------------------|--------------------------------|-----------|
| BASE          | 0.160-0.185        | 0.1875-0.300      | 0.305-0.340       | V <sub>50</sub> (P1,30°,revC)  | C         |
| REV A         | 0.160-0.185        | 0.1875-0.300      | 0.305-0.340       | V <sub>50</sub> (P1,30°,revC)  | C         |
| REV A1        | 0.160-0.185        | 0.1875-0.300      | 0.305-0.340       | V <sub>50</sub> (P1,30°,revC)  | C         |
| REV A2        | 0.160-0.185        | 0.1875-0.300      | 0.305-0.340       | V <sub>50</sub> (P1,30°,revC)  | C         |
| REV B         | 0.160-0.185        | 0.1875-0.300      | 0.305-0.340       | V <sub>50</sub> (P1,30°,revC)  | U         |
| REV C         | 0.102-0.120        | 0.125 -0.300      | 0.305-0.340       | V <sub>50</sub> (P1,30°,revC)  | U         |
| REV C1        | 0.102-0.120        | 0.125 -0.300      | 0.305-0.340       | V <sub>50</sub> (P1,30°,revC)  | U         |
| REV C2        | 0.100-0.120        | 0.125 -0.315      | 0.320-0.340       | V <sub>50</sub> (P1,30°,revC2) | U         |
| REV D         | 0.100-0.120        | 0.125 -0.315      | 0.320-0.340       | V <sub>50</sub> (P1,30°,revC2) | U         |
| REV D1        | 0.100-0.120        | 0.125 -0.300      | 0.305-0.340       | V <sub>50</sub> (P1,30°,revC2) | U         |

## PROJECTILE P2: CAL 0.50 AP M2 @ 30 DEG OBLIQUITY

| SPEC REVISION | UNDERSIZE TH RANGE | REQUIRED TH RANGE | OVERSIZE TH RANGE | MATH MODEL                     | SEC CLASS |
|---------------|--------------------|-------------------|-------------------|--------------------------------|-----------|
| BASE          | 0.275-0.300        | 0.301-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC)  | C         |
| REV A         | 0.275-0.300        | 0.301-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC)  | C         |
| REV A1        | 0.275-0.300        | 0.301-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC)  | C         |
| REV A2        | 0.275-0.300        | 0.301-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC)  | U         |
| REV B         | 0.275-0.300        | 0.301-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC)  | U         |
| REV C         | 0.275-0.300        | 0.301-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC)  | U         |
| REV C1        | 0.275-0.300        | 0.301-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC)  | U         |
| REV C2        | 0.290-0.315        | 0.316-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC2) | U         |
| REV D         | 0.290-0.315        | 0.316-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC2) | U         |
| REV D1        | 0.290-0.300        | 0.301-0.590       | 0.595-0.625       | V <sub>50</sub> (P2,30°,revC2) | U         |

## PROJECTILE P3: 14.5 MM API B32 @ 30 DEG OBLIQUITY

| SPEC REVISION | UNDERSIZE TH RANGE | REQUIRED TH RANGE | OVERSIZE TH RANGE | MATH MODEL                     | SEC CLASS |
|---------------|--------------------|-------------------|-------------------|--------------------------------|-----------|
| BASE          | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC)  | C         |
| REV A         | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC)  | C         |
| REV A1        | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC)  | C         |
| REV A2        | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC)  | U         |
| REV B         | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC)  | U         |
| REV C         | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC)  | U         |
| REV C1        | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC)  | U         |
| REV C2        | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC2) | U         |
| REV D         | 0.575-0.590        | 0.591-0.765       | 0.770-0.790       | V <sub>50</sub> (P3,30°,revC2) | U         |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 7 (CONTINUED)

MIL-A-46100 REVISIONS  
 ARMOR PLATE THICKNESS RANGES [INCHES]  
 $V_{50}$  BALLISTIC LIMIT VELOCITY MATH MODELS  
 SECURITY CLASSIFICATIONS

## PROJECTILE P4: 14.5 MM API BS41 @ 30 DEG OBLIQUITY

| SPEC<br>REVISION | UNDERSIZE<br>TH RANGE | REQUIRED<br>TH RANGE | OVERSIZE<br>TH RANGE | MATH<br>MODEL                        | SEC<br>CLASS |
|------------------|-----------------------|----------------------|----------------------|--------------------------------------|--------------|
| REV C            | 0.740-0.765           | 0.766-1.065          | 1.070-1.090          | $V_{50}(P4, 30^\circ, \text{revC})$  | U            |
| REV C1           | 0.740-0.765           | 0.766-1.065          | 1.070-1.090          | $V_{50}(P4, 30^\circ, \text{revC})$  | U            |
| REV C2           | 0.740-0.765           | 0.766-1.065          | 1.070-1.090          | $V_{50}(P4, 30^\circ, \text{revC2})$ | U            |
| REV D            | 0.740-0.765           | 0.766-1.065          | 1.070-1.090          | $V_{50}(P4, 30^\circ, \text{revC2})$ | U            |

## PROJECTILE P5: 20 MM API-T M602 @ 0 DEG OBLIQUITY

| SPEC<br>REVISION | UNDERSIZE<br>TH RANGE | REQUIRED<br>TH RANGE | OVERSIZE<br>TH RANGE | MATH<br>MODEL                       | SEC<br>CLASS |
|------------------|-----------------------|----------------------|----------------------|-------------------------------------|--------------|
| REV C2           | 1.020-1.065           | 1.066-2.100          | 2.105-2.175          | $V_{50}(P5, 0^\circ, \text{revC})$  | U            |
| REV D            | 1.020-1.065           | 1.066-2.100          | 2.105-2.175          | $V_{50}(P5, 0^\circ, \text{revC2})$ | U            |

A REVIEW OF THE  $V_{50}$  BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 8

| MIL SPEC MIL-A-46100 REVISION C<br>CSTA AP MATH MODEL COEFFICIENTS FOR<br>MINIMUM REQUIRED $V_{50}$ BALLISTIC LIMIT VELOCITY EQUATIONS<br>OBLIQUITY: 30 DEGREES |                         |                           |                           |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------|---------------------------|--------|
| $V_{50}(P1, 30^\circ, revC) = \frac{1}{2c} [-b + \sqrt{b^2 - 4c(a-t)}]$                                                                                         |                         |                           |                           |        |
| $V_{50}(P2, 30^\circ, revC) = a + bt + ct^2 + dt^3$                                                                                                             |                         |                           |                           |        |
| $V_{50}(P3, 30^\circ, revC) = a - bt + ct^2$                                                                                                                    |                         |                           |                           |        |
| PROJ                                                                                                                                                            | a                       | b                         | c                         | d      |
| P1                                                                                                                                                              | $8.7458 \times 10^{-2}$ | $1.196828 \times 10^{-5}$ | $2.690298 \times 10^{-8}$ |        |
| P2                                                                                                                                                              | -356.5                  | 8759.2                    | -8695.4                   | 4366.1 |
| P3                                                                                                                                                              | 850.2                   | 3388.5                    | -777.77                   |        |

A REVIEW OF THE  $V_{50}$  BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 9

| MIL SPEC MIL-A-46100 REVISIONS C, C2, & D<br>CSTA AP MATH MODEL COEFFICIENTS FOR<br>MINIMUM REQUIRED $V_{50}$ BALLISTIC LIMIT VELOCITY EQUATIONS<br>OBLIQUITIES: 30 & 0 DEGREES |      |     |      |        |        |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|------|--------|--------|----------------|
| $V_{50}(PROJ, OBL, revR) = 1000\sqrt{a+bt} - 1.645\hat{\sigma}$                                                                                                                 |      |     |      |        |        |                |
| PROJECTILE                                                                                                                                                                      | PROJ | OBL | R    | a      | b      | $\hat{\sigma}$ |
| CAL 0.30 AP M2                                                                                                                                                                  | P1   | 30  | C2,D | -1.617 | 29.287 | 91.85          |
| CAL 0.50 AP M2                                                                                                                                                                  | P2   | 30  | C2,D | -0.388 | 14.093 | 85.17          |
| 14.5 MM API B32                                                                                                                                                                 | P3   | 30  | C2,D | -0.260 | 10.759 | 76.29          |
| 14.5 MM API BS41                                                                                                                                                                | P4   | 30  | C2,D | -3.928 | 12.524 | 60.36          |
| 20 MM API-T M602                                                                                                                                                                | P5   | 0   | C2   | -3.330 | 6.849  | 35.51          |
| 20 MM API-T M602                                                                                                                                                                | P5   | 0   | D    | -3.550 | 6.790  | 48.40          |
| 14.5 MM API BS41                                                                                                                                                                | P4   | 30  | C    | -3.927 | 12.366 | 36.65          |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 10

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S  
PROJECTILE P1: 30 AP M2 @ 30 DEG OBLIQUITY

| REV C<br>THICKNESS<br>[IN] | REV C<br>REQ BL(P)<br>[FPS] | REV C2<br>THICKNESS<br>[IN] | REV C2<br>REQ BL(P)<br>[FPS] | REV D<br>THICKNESS<br>[IN] | REV D<br>REQ BL(P)<br>[FPS] |
|----------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|
| 0.102                      | 545                         | 0.100                       | 994                          | 0.100                      | 994                         |
| 0.105                      | 615                         | 0.105                       | 1057                         | 0.105                      | 1057                        |
| 0.110                      | 720                         | 0.110                       | 1116                         | 0.110                      | 1116                        |
| 0.115                      | 813                         | 0.115                       | 1172                         | 0.115                      | 1172                        |
| 0.120                      | 900                         | 0.120                       | 1226                         | 0.120                      | 1226                        |
| 0.125                      | 980                         | 0.125                       | 1279                         | 0.125                      | 1279                        |
| 0.130                      | 1055                        | 0.130                       | 1329                         | 0.130                      | 1329                        |
| 0.135                      | 1125                        | 0.135                       | 1378                         | 0.135                      | 1378                        |
| 0.140                      | 1193                        | 0.140                       | 1425                         | 0.140                      | 1425                        |
| 0.145                      | 1257                        | 0.145                       | 1471                         | 0.145                      | 1471                        |
| 0.150                      | 1318                        | 0.150                       | 1515                         | 0.150                      | 1515                        |
| 0.155                      | 1378                        | 0.155                       | 1558                         | 0.155                      | 1558                        |
| 0.160                      | 1434                        | 0.160                       | 1601                         | 0.160                      | 1601                        |
| 0.165                      | 1490                        | 0.165                       | 1642                         | 0.165                      | 1642                        |
| 0.170                      | 1543                        | 0.170                       | 1682                         | 0.170                      | 1682                        |
| 0.175                      | 1595                        | 0.175                       | 1722                         | 0.175                      | 1722                        |
| 0.180                      | 1646                        | 0.180                       | 1761                         | 0.180                      | 1761                        |
| 0.185                      | 1695                        | 0.185                       | 1799                         | 0.185                      | 1799                        |
| 0.190                      | 1742                        | 0.190                       | 1836                         | 0.190                      | 1836                        |
| 0.195                      | 1789                        | 0.195                       | 1872                         | 0.195                      | 1872                        |
| 0.200                      | 1835                        | 0.200                       | 1908                         | 0.200                      | 1908                        |
| 0.205                      | 1880                        | 0.205                       | 1943                         | 0.205                      | 1943                        |
| 0.210                      | 1923                        | 0.210                       | 1978                         | 0.210                      | 1978                        |
| 0.215                      | 1966                        | 0.215                       | 2012                         | 0.215                      | 2012                        |
| 0.220                      | 2008                        | 0.220                       | 2046                         | 0.220                      | 2046                        |
| 0.225                      | 2050                        | 0.225                       | 2079                         | 0.225                      | 2079                        |
| 0.230                      | 2090                        | 0.230                       | 2111                         | 0.230                      | 2111                        |
| 0.235                      | 2130                        | 0.235                       | 2144                         | 0.235                      | 2144                        |
| 0.240                      | 2169                        | 0.240                       | 2175                         | 0.240                      | 2175                        |
| 0.245                      | 2208                        | 0.245                       | 2207                         | 0.245                      | 2207                        |
| 0.250                      | 2246                        | 0.250                       | 2237                         | 0.250                      | 2237                        |
| 0.255                      | 2283                        | 0.255                       | 2268                         | 0.255                      | 2268                        |
| 0.260                      | 2320                        | 0.260                       | 2298                         | 0.260                      | 2298                        |
| 0.265                      | 2356                        | 0.265                       | 2328                         | 0.265                      | 2328                        |
| 0.270                      | 2392                        | 0.270                       | 2357                         | 0.270                      | 2357                        |
| 0.275                      | 2427                        | 0.275                       | 2386                         | 0.275                      | 2386                        |
| 0.280                      | 2462                        | 0.280                       | 2415                         | 0.280                      | 2415                        |
| 0.285                      | 2496                        | 0.285                       | 2443                         | 0.285                      | 2443                        |
| 0.290                      | 2530                        | 0.290                       | 2471                         | 0.290                      | 2471                        |
| 0.295                      | 2564                        | 0.295                       | 2499                         | 0.295                      | 2499                        |

A REVIEW OF THE  $V_{50}$  BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 10 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S

PROJECTILE P1: 30 AP M2 @ 30 DEG OBLIQUITY

| REV C<br>THICKNESS<br>[IN] | REV C<br>REQ BL(P)<br>[FPS] | REV C2<br>THICKNESS<br>[IN] | REV C2<br>REQ BL(P)<br>[FPS] | REV D<br>THICKNESS<br>[IN] | REV D<br>REQ BL(P)<br>[FPS] |
|----------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|
| 0.300                      | 2597                        | 0.300                       | 2526                         | 0.300                      | 2526                        |
| 0.305                      | 2630                        | 0.305                       | 2554                         | 0.305                      | 2554                        |
| 0.310                      | 2662                        | 0.310                       | 2581                         | 0.310                      | 2581                        |
| 0.315                      | 2694                        | 0.315                       | 2607                         | 0.315                      | 2607                        |
| 0.320                      | 2726                        | 0.320                       | 2634                         | 0.320                      | 2634                        |
| 0.325                      | 2758                        | 0.325                       | 2660                         | 0.325                      | 2660                        |
| 0.330                      | 2788                        | 0.330                       | 2686                         | 0.330                      | 2686                        |
| 0.335                      | 2819                        | 0.335                       | 2711                         | 0.335                      | 2711                        |
| 0.340                      | 2850                        | 0.340                       | 2737                         | 0.340                      | 2737                        |

# A REVIEW OF THE V<sub>50</sub> BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 11

MIL SPEC MIL-A-46100

MINIMUM REQUIRED V<sub>50</sub> PROTECTION BALLISTIC LIMITS, BL(P)'S  
PROJECTILE P2: 50 AP M2 @ 30 DEG OBLIQUITY

| REV C<br>THICKNESS<br>[IN] | REV C<br>REQ BL(P)<br>[FPS] | REV C2<br>THICKNESS<br>[IN] | REV C2<br>REQ BL(P)<br>[FPS] | REV D<br>THICKNESS<br>[IN] | REV D<br>REQ BL(P)<br>[FPS] |
|----------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|
| 0.275                      | 1482                        | 0.290                       | 1783                         | 0.290                      | 1783                        |
| 0.280                      | 1507                        | 0.295                       | 1801                         | 0.295                      | 1801                        |
| 0.285                      | 1532                        | 0.300                       | 1820                         | 0.300                      | 1820                        |
| 0.290                      | 1557                        | 0.305                       | 1837                         | 0.305                      | 1837                        |
| 0.295                      | 1582                        | 0.310                       | 1855                         | 0.310                      | 1855                        |
| 0.300                      | 1606                        | 0.315                       | 1873                         | 0.315                      | 1873                        |
| 0.301                      | 1611                        | 0.316                       | 1876                         | 0.316                      | 1876                        |
| 0.305                      | 1630                        | 0.320                       | 1890                         | 0.320                      | 1890                        |
| 0.310                      | 1653                        | 0.325                       | 1907                         | 0.325                      | 1907                        |
| 0.315                      | 1676                        | 0.330                       | 1925                         | 0.330                      | 1925                        |
| 0.320                      | 1699                        | 0.335                       | 1942                         | 0.335                      | 1942                        |
| 0.325                      | 1722                        | 0.340                       | 1958                         | 0.340                      | 1958                        |
| 0.330                      | 1744                        | 0.345                       | 1975                         | 0.345                      | 1975                        |
| 0.335                      | 1767                        | 0.350                       | 1992                         | 0.350                      | 1992                        |
| 0.340                      | 1789                        | 0.355                       | 2008                         | 0.355                      | 2008                        |
| 0.345                      | 1810                        | 0.360                       | 2025                         | 0.360                      | 2025                        |
| 0.350                      | 1832                        | 0.365                       | 2041                         | 0.365                      | 2041                        |
| 0.355                      | 1853                        | 0.370                       | 2057                         | 0.370                      | 2057                        |
| 0.360                      | 1874                        | 0.375                       | 2073                         | 0.375                      | 2073                        |
| 0.365                      | 1895                        | 0.380                       | 2089                         | 0.380                      | 2089                        |
| 0.370                      | 1916                        | 0.385                       | 2104                         | 0.385                      | 2104                        |
| 0.375                      | 1936                        | 0.390                       | 2120                         | 0.390                      | 2120                        |
| 0.380                      | 1956                        | 0.395                       | 2136                         | 0.395                      | 2136                        |
| 0.385                      | 1976                        | 0.400                       | 2151                         | 0.400                      | 2151                        |
| 0.390                      | 1996                        | 0.405                       | 2166                         | 0.405                      | 2166                        |
| 0.395                      | 2016                        | 0.410                       | 2182                         | 0.410                      | 2182                        |
| 0.400                      | 2035                        | 0.415                       | 2197                         | 0.415                      | 2197                        |
| 0.405                      | 2055                        | 0.420                       | 2212                         | 0.420                      | 2212                        |
| 0.410                      | 2074                        | 0.425                       | 2227                         | 0.425                      | 2227                        |
| 0.415                      | 2093                        | 0.430                       | 2242                         | 0.430                      | 2242                        |
| 0.420                      | 2112                        | 0.435                       | 2256                         | 0.435                      | 2256                        |
| 0.425                      | 2130                        | 0.440                       | 2271                         | 0.440                      | 2271                        |
| 0.430                      | 2149                        | 0.445                       | 2286                         | 0.445                      | 2286                        |
| 0.435                      | 2167                        | 0.450                       | 2300                         | 0.450                      | 2300                        |
| 0.440                      | 2186                        | 0.455                       | 2314                         | 0.455                      | 2314                        |
| 0.445                      | 2204                        | 0.460                       | 2329                         | 0.460                      | 2329                        |
| 0.450                      | 2222                        | 0.465                       | 2343                         | 0.465                      | 2343                        |
| 0.455                      | 2240                        | 0.470                       | 2357                         | 0.470                      | 2357                        |
| 0.460                      | 2257                        | 0.475                       | 2371                         | 0.475                      | 2371                        |
| 0.465                      | 2275                        | 0.480                       | 2385                         | 0.480                      | 2385                        |

# A REVIEW OF THE V<sub>50</sub> BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 11 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED V<sub>50</sub> PROTECTION BALLISTIC LIMITS, BL(P)'S

PROJECTILE P2: 50 AP M2 @ 30 DEG OBLIQUITY

| REV C<br>THICKNESS<br>[IN] | REV C<br>REQ BL(P)<br>[FPS] | REV C2<br>THICKNESS<br>[IN] | REV C2<br>REQ BL(P)<br>[FPS] | REV D<br>THICKNESS<br>[IN] | REV D<br>REQ BL(P)<br>[FPS] |
|----------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|
| 0.470                      | 2292                        | 0.485                       | 2399                         | 0.485                      | 2399                        |
| 0.475                      | 2310                        | 0.490                       | 2413                         | 0.490                      | 2413                        |
| 0.480                      | 2327                        | 0.495                       | 2427                         | 0.495                      | 2427                        |
| 0.485                      | 2344                        | 0.500                       | 2440                         | 0.500                      | 2440                        |
| 0.490                      | 2361                        | 0.505                       | 2454                         | 0.505                      | 2454                        |
| 0.495                      | 2378                        | 0.510                       | 2468                         | 0.510                      | 2468                        |
| 0.500                      | 2395                        | 0.515                       | 2481                         | 0.515                      | 2481                        |
| 0.505                      | 2412                        | 0.520                       | 2494                         | 0.520                      | 2494                        |
| 0.510                      | 2428                        | 0.525                       | 2508                         | 0.525                      | 2508                        |
| 0.515                      | 2445                        | 0.530                       | 2521                         | 0.530                      | 2521                        |
| 0.520                      | 2461                        | 0.535                       | 2534                         | 0.535                      | 2534                        |
| 0.525                      | 2478                        | 0.540                       | 2547                         | 0.540                      | 2547                        |
| 0.530                      | 2494                        | 0.545                       | 2560                         | 0.545                      | 2560                        |
| 0.535                      | 2510                        | 0.550                       | 2573                         | 0.550                      | 2573                        |
| 0.540                      | 2526                        | 0.555                       | 2586                         | 0.555                      | 2586                        |
| 0.545                      | 2542                        | 0.560                       | 2599                         | 0.560                      | 2599                        |
| 0.550                      | 2558                        | 0.565                       | 2612                         | 0.565                      | 2612                        |
| 0.555                      | 2573                        | 0.570                       | 2625                         | 0.570                      | 2625                        |
| 0.560                      | 2589                        | 0.575                       | 2638                         | 0.575                      | 2638                        |
| 0.565                      | 2604                        | 0.580                       | 2650                         | 0.580                      | 2650                        |
| 0.570                      | 2620                        | 0.585                       | 2663                         | 0.585                      | 2663                        |
| 0.575                      | 2635                        | 0.590                       | 2675                         | 0.590                      | 2675                        |
| 0.580                      | 2651                        | 0.595                       | 2688                         | 0.595                      | 2688                        |
| 0.585                      | 2666                        | 0.600                       | 2700                         | 0.600                      | 2700                        |
| 0.590                      | 2681                        | 0.605                       | 2713                         | 0.605                      | 2713                        |
| 0.595                      | 2696                        | 0.610                       | 2725                         | 0.610                      | 2725                        |
| 0.600                      | 2711                        | 0.615                       | 2737                         | 0.615                      | 2737                        |
| 0.605                      | 2726                        | 0.620                       | 2750                         | 0.620                      | 2750                        |
| 0.610                      | 2741                        | 0.625                       | 2762                         | 0.625                      | 2762                        |
| 0.615                      | 2756                        |                             |                              |                            |                             |
| 0.620                      | 2770                        |                             |                              |                            |                             |
| 0.625                      | 2785                        |                             |                              |                            |                             |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 12

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S

PROJECTILE P3: 14.5 MM API B32 @ 30 DEG OBLIQUITY

| REV C<br>THICKNESS<br>[IN] | REV C<br>REQ BL(P)<br>[FPS] | REV C2<br>THICKNESS<br>[IN] | REV C2<br>REQ BL(P)<br>[FPS] | REV D<br>THICKNESS<br>[IN] | REV D<br>REQ BL(P)<br>[FPS] |
|----------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|
| 0.575                      | 2369                        | 0.575                       | 2320                         | 0.575                      | 2320                        |
| 0.580                      | 2380                        | 0.580                       | 2331                         | 0.580                      | 2331                        |
| 0.585                      | 2391                        | 0.585                       | 2342                         | 0.585                      | 2342                        |
| 0.590                      | 2402                        | 0.590                       | 2353                         | 0.590                      | 2353                        |
| 0.591                      | 2404                        | 0.591                       | 2355                         | 0.591                      | 2355                        |
| 0.595                      | 2412                        | 0.595                       | 2364                         | 0.595                      | 2364                        |
| 0.600                      | 2423                        | 0.600                       | 2374                         | 0.600                      | 2374                        |
| 0.605                      | 2434                        | 0.605                       | 2385                         | 0.605                      | 2385                        |
| 0.610                      | 2445                        | 0.610                       | 2396                         | 0.610                      | 2396                        |
| 0.615                      | 2456                        | 0.615                       | 2407                         | 0.615                      | 2407                        |
| 0.620                      | 2466                        | 0.620                       | 2417                         | 0.620                      | 2417                        |
| 0.625                      | 2477                        | 0.625                       | 2428                         | 0.625                      | 2428                        |
| 0.630                      | 2487                        | 0.630                       | 2438                         | 0.630                      | 2438                        |
| 0.635                      | 2498                        | 0.635                       | 2449                         | 0.635                      | 2449                        |
| 0.640                      | 2508                        | 0.640                       | 2459                         | 0.640                      | 2459                        |
| 0.645                      | 2519                        | 0.645                       | 2469                         | 0.645                      | 2469                        |
| 0.650                      | 2529                        | 0.650                       | 2480                         | 0.650                      | 2480                        |
| 0.655                      | 2540                        | 0.655                       | 2490                         | 0.655                      | 2490                        |
| 0.660                      | 2550                        | 0.660                       | 2500                         | 0.660                      | 2500                        |
| 0.665                      | 2560                        | 0.665                       | 2511                         | 0.665                      | 2511                        |
| 0.670                      | 2570                        | 0.670                       | 2521                         | 0.670                      | 2521                        |
| 0.675                      | 2580                        | 0.675                       | 2531                         | 0.675                      | 2531                        |
| 0.680                      | 2591                        | 0.680                       | 2541                         | 0.680                      | 2541                        |
| 0.685                      | 2601                        | 0.685                       | 2551                         | 0.685                      | 2551                        |
| 0.690                      | 2611                        | 0.690                       | 2561                         | 0.690                      | 2561                        |
| 0.695                      | 2621                        | 0.695                       | 2571                         | 0.695                      | 2571                        |
| 0.700                      | 2631                        | 0.700                       | 2581                         | 0.700                      | 2581                        |
| 0.705                      | 2641                        | 0.705                       | 2591                         | 0.705                      | 2591                        |
| 0.710                      | 2651                        | 0.710                       | 2601                         | 0.710                      | 2601                        |
| 0.715                      | 2661                        | 0.715                       | 2611                         | 0.715                      | 2611                        |
| 0.720                      | 2670                        | 0.720                       | 2621                         | 0.720                      | 2621                        |
| 0.725                      | 2680                        | 0.725                       | 2630                         | 0.725                      | 2630                        |
| 0.730                      | 2690                        | 0.730                       | 2640                         | 0.730                      | 2640                        |
| 0.735                      | 2700                        | 0.735                       | 2650                         | 0.735                      | 2650                        |
| 0.740                      | 2710                        | 0.740                       | 2659                         | 0.740                      | 2659                        |
| 0.745                      | 2719                        | 0.745                       | 2669                         | 0.745                      | 2659                        |
| 0.750                      | 2729                        | 0.750                       | 2679                         | 0.750                      | 2679                        |
| 0.755                      | 2739                        | 0.755                       | 2688                         | 0.755                      | 2688                        |
| 0.760                      | 2748                        | 0.760                       | 2698                         | 0.760                      | 2698                        |
| 0.765                      | 2758                        | 0.765                       | 2707                         | 0.765                      | 2707                        |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 12 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S

PROJECTILE P3: 14.5 MM API B32 @ 30 DEG OBLIQUITY

| REV C     | REV C     | REV C2    | REV C2    | REV D     | REV D     |
|-----------|-----------|-----------|-----------|-----------|-----------|
| THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) |
| [IN]      | [FPS]     | [IN]      | [FPS]     | [IN]      | [FPS]     |
| 0.770     | 2767      | 0.770     | 2717      | 0.770     | 2717      |
| 0.775     | 2777      | 0.775     | 2726      | 0.775     | 2726      |
| 0.780     | 2786      | 0.780     | 2736      | 0.780     | 2736      |
| 0.785     | 2796      | 0.785     | 2745      | 0.785     | 2745      |
| 0.790     | 2805      | 0.790     | 2754      | 0.790     | 2754      |

# A REVIEW OF THE V<sub>50</sub> BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 13

MIL SPEC MIL-A-46100  
 MINIMUM REQUIRED V<sub>50</sub> PROTECTION BALLISTIC LIMITS, BL(P)'S  
 PROJECTILE P4: 14.5 MM API BS41 @ 30 DEG OBLIQUITY

| REV C     | REV C     | REV C2    | REV C2    | REV D     | REV D     |
|-----------|-----------|-----------|-----------|-----------|-----------|
| THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) |
| [IN]      | [FPS]     | [IN]      | [FPS]     | [IN]      | [FPS]     |
| 0.740     | 2225      | 0.740     | 2212      | 0.740     | 2212      |
| 0.745     | 2239      | 0.745     | 2225      | 0.745     | 2225      |
| 0.750     | 2252      | 0.750     | 2239      | 0.750     | 2239      |
| 0.755     | 2265      | 0.755     | 2252      | 0.755     | 2252      |
| 0.760     | 2279      | 0.760     | 2265      | 0.760     | 2265      |
| 0.765     | 2292      | 0.765     | 2278      | 0.765     | 2278      |
| 0.766     | 2295      | 0.766     | 2281      | 0.766     | 2281      |
| 0.770     | 2305      | 0.770     | 2292      | 0.770     | 2292      |
| 0.775     | 2318      | 0.775     | 2305      | 0.775     | 2305      |
| 0.780     | 2331      | 0.780     | 2318      | 0.780     | 2318      |
| 0.785     | 2344      | 0.785     | 2331      | 0.785     | 2331      |
| 0.790     | 2357      | 0.790     | 2343      | 0.790     | 2343      |
| 0.795     | 2369      | 0.795     | 2356      | 0.795     | 2356      |
| 0.800     | 2382      | 0.800     | 2369      | 0.800     | 2369      |
| 0.805     | 2395      | 0.805     | 2382      | 0.805     | 2382      |
| 0.810     | 2407      | 0.810     | 2394      | 0.810     | 2394      |
| 0.815     | 2420      | 0.815     | 2407      | 0.815     | 2407      |
| 0.820     | 2432      | 0.820     | 2419      | 0.820     | 2419      |
| 0.825     | 2445      | 0.825     | 2431      | 0.825     | 2431      |
| 0.830     | 2457      | 0.830     | 2444      | 0.830     | 2444      |
| 0.835     | 2469      | 0.835     | 2456      | 0.835     | 2456      |
| 0.840     | 2481      | 0.840     | 2468      | 0.840     | 2468      |
| 0.845     | 2494      | 0.845     | 2481      | 0.845     | 2481      |
| 0.850     | 2506      | 0.850     | 2493      | 0.850     | 2493      |
| 0.855     | 2518      | 0.855     | 2505      | 0.855     | 2505      |
| 0.860     | 2530      | 0.860     | 2517      | 0.860     | 2517      |
| 0.865     | 2542      | 0.865     | 2529      | 0.865     | 2529      |
| 0.870     | 2553      | 0.870     | 2540      | 0.870     | 2540      |
| 0.875     | 2565      | 0.875     | 2552      | 0.875     | 2552      |
| 0.880     | 2577      | 0.880     | 2564      | 0.880     | 2564      |
| 0.885     | 2589      | 0.885     | 2576      | 0.885     | 2576      |
| 0.890     | 2600      | 0.890     | 2588      | 0.890     | 2588      |
| 0.895     | 2612      | 0.895     | 2599      | 0.895     | 2599      |
| 0.900     | 2623      | 0.900     | 2611      | 0.900     | 2611      |
| 0.905     | 2635      | 0.905     | 2622      | 0.905     | 2622      |
| 0.910     | 2646      | 0.910     | 2634      | 0.910     | 2634      |
| 0.915     | 2658      | 0.915     | 2645      | 0.915     | 2645      |
| 0.920     | 2669      | 0.920     | 2657      | 0.920     | 2657      |
| 0.925     | 2680      | 0.925     | 2668      | 0.925     | 2668      |
| 0.930     | 2692      | 0.930     | 2679      | 0.930     | 2679      |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 13 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S

PROJECTILE P4: 14.5 MM API BS41 @ 30 DEG OBLIQUITY

| REV C<br>THICKNESS<br>[IN] | REV C<br>REQ BL(P)<br>[FPS] | REV C2<br>THICKNESS<br>[IN] | REV C2<br>REQ BL(P)<br>[FPS] | REV D<br>THICKNESS<br>[IN] | REV D<br>REQ BL(P)<br>[FPS] |
|----------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|
| 0.935                      | 2703                        | 0.935                       | 2690                         | 0.935                      | 2690                        |
| 0.940                      | 2714                        | 0.940                       | 2702                         | 0.940                      | 2702                        |
| 0.945                      | 2725                        | 0.945                       | 2713                         | 0.945                      | 2713                        |
| 0.950                      | 2736                        | 0.950                       | 2724                         | 0.950                      | 2724                        |
| 0.955                      | 2747                        | 0.955                       | 2735                         | 0.955                      | 2735                        |
| 0.960                      | 2758                        | 0.960                       | 2746                         | 0.960                      | 2746                        |
| 0.965                      | 2769                        | 0.965                       | 2757                         | 0.965                      | 2757                        |
| 0.975                      | 2791                        | 0.975                       | 2779                         | 0.975                      | 2779                        |
| 0.980                      | 2802                        | 0.980                       | 2790                         | 0.980                      | 2790                        |
| 0.985                      | 2813                        | 0.985                       | 2800                         | 0.985                      | 2800                        |
| 0.990                      | 2823                        | 0.990                       | 2811                         | 0.990                      | 2811                        |
| 0.995                      | 2834                        | 0.995                       | 2822                         | 0.995                      | 2822                        |
| 1.000                      | 2845                        | 1.000                       | 2832                         | 1.000                      | 2832                        |
| 1.005                      | 2855                        | 1.005                       | 2843                         | 1.005                      | 2843                        |
| 1.010                      | 2866                        | 1.010                       | 2854                         | 1.010                      | 2854                        |
| 1.015                      | 2876                        | 1.015                       | 2865                         | 1.015                      | 2865                        |
| 1.020                      | 2887                        | 1.020                       | 2875                         | 1.020                      | 2875                        |
| 1.025                      | 2897                        | 1.025                       | 2886                         | 1.025                      | 2886                        |
| 1.030                      | 2908                        | 1.030                       | 2896                         | 1.030                      | 2896                        |
| 1.035                      | 2918                        | 1.035                       | 2907                         | 1.035                      | 2907                        |
| 1.040                      | 2929                        | 1.040                       | 2917                         | 1.040                      | 2917                        |
| 1.045                      | 2939                        | 1.045                       | 2927                         | 1.045                      | 2927                        |
| 1.050                      | 2949                        | 1.050                       | 2938                         | 1.050                      | 2938                        |
| 1.055                      | 2959                        | 1.055                       | 2948                         | 1.055                      | 2948                        |
| 1.060                      | 2970                        | 1.060                       | 2958                         | 1.060                      | 2958                        |
| 1.065                      | 2980                        | 1.065                       | 2968                         | 1.065                      | 2968                        |
| 1.070                      | 2990                        | 1.070                       | 2979                         | 1.070                      | 2979                        |
| 1.075                      | 3000                        | 1.075                       | 2989                         | 1.075                      | 2989                        |
| 1.080                      | 3010                        | 1.080                       | 2999                         | 1.080                      | 2999                        |
| 1.085                      | 3020                        | 1.085                       | 3009                         | 1.085                      | 3009                        |
| 1.090                      | 3030                        | 1.090                       | 3019                         | 1.090                      | 3019                        |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 14

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S  
PROJECTILE P5: 20 MM API-T M602 @ 30 DEG OBLIQUITY

| REV C     | REV C     | REV C2    | REV C2    | REV D     | REV D     |
|-----------|-----------|-----------|-----------|-----------|-----------|
| THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) |
| [IN]      | [FPS]     | [IN]      | [FPS]     | [IN]      | [FPS]     |
|           |           | 1.020     | 1801      | 1.020     | 1758      |
|           |           | 1.025     | 1810      | 1.025     | 1767      |
|           |           | 1.030     | 1819      | 1.030     | 1776      |
|           |           | 1.035     | 1828      | 1.035     | 1785      |
|           |           | 1.040     | 1837      | 1.040     | 1794      |
|           |           | 1.045     | 1846      | 1.045     | 1804      |
|           |           | 1.050     | 1855      | 1.050     | 1813      |
|           |           | 1.055     | 1864      | 1.055     | 1821      |
|           |           | 1.060     | 1873      | 1.060     | 1830      |
|           |           | 1.065     | 1882      | 1.065     | 1839      |
|           |           | 1.066     | 1884      | 1.066     | 1841      |
|           |           | 1.070     | 1891      | 1.070     | 1848      |
|           |           | 1.075     | 1899      | 1.075     | 1857      |
|           |           | 1.080     | 1908      | 1.080     | 1866      |
|           |           | 1.085     | 1917      | 1.085     | 1874      |
|           |           | 1.090     | 1925      | 1.090     | 1883      |
|           |           | 1.095     | 1934      | 1.095     | 1892      |
|           |           | 1.100     | 1943      | 1.100     | 1900      |
|           |           | 1.105     | 1951      | 1.105     | 1909      |
|           |           | 1.110     | 1960      | 1.110     | 1917      |
|           |           | 1.115     | 1968      | 1.115     | 1926      |
|           |           | 1.120     | 1977      | 1.120     | 1934      |
|           |           | 1.125     | 1985      | 1.125     | 1943      |
|           |           | 1.130     | 1993      | 1.130     | 1951      |
|           |           | 1.135     | 2002      | 1.135     | 1959      |
|           |           | 1.140     | 2010      | 1.140     | 1968      |
|           |           | 1.145     | 2018      | 1.145     | 1976      |
|           |           | 1.150     | 2026      | 1.150     | 1984      |
|           |           | 1.155     | 2035      | 1.155     | 1992      |
|           |           | 1.160     | 2043      | 1.160     | 2001      |
|           |           | 1.165     | 2051      | 1.165     | 2009      |
|           |           | 1.170     | 2059      | 1.170     | 2017      |
|           |           | 1.175     | 2067      | 1.175     | 2025      |
|           |           | 1.180     | 2075      | 1.180     | 2033      |
|           |           | 1.185     | 2083      | 1.185     | 2041      |
|           |           | 1.190     | 2091      | 1.190     | 2049      |
|           |           | 1.195     | 2099      | 1.195     | 2057      |
|           |           | 1.200     | 2107      | 1.200     | 2065      |
|           |           | 1.205     | 2115      | 1.205     | 2073      |
|           |           | 1.210     | 2123      | 1.210     | 2081      |

A REVIEW OF THE  $V_{50}$  BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 14 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S  
PROJECTILE P5: 20 MM API-T M602 @ 30 DEG OBLIQUITY

| REV C<br>THICKNESS<br>[IN] | REV C<br>REQ BL(P)<br>[FPS] | REV C2<br>THICKNESS<br>[IN] | REV C2<br>REQ BL(P)<br>[FPS] | REV D<br>THICKNESS<br>[IN] | REV D<br>REQ BL(P)<br>[FPS] |
|----------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|
|                            |                             | 1.215                       | 2131                         | 1.215                      | 2088                        |
|                            |                             | 1.220                       | 2138                         | 1.220                      | 2096                        |
|                            |                             | 1.225                       | 2146                         | 1.225                      | 2104                        |
|                            |                             | 1.230                       | 2154                         | 1.230                      | 2112                        |
|                            |                             | 1.235                       | 2162                         | 1.235                      | 2120                        |
|                            |                             | 1.240                       | 2169                         | 1.240                      | 2127                        |
|                            |                             | 1.245                       | 2177                         | 1.245                      | 2135                        |
|                            |                             | 1.250                       | 2185                         | 1.250                      | 2143                        |
|                            |                             | 1.255                       | 2192                         | 1.255                      | 2150                        |
|                            |                             | 1.260                       | 2200                         | 1.260                      | 2158                        |
|                            |                             | 1.265                       | 2207                         | 1.265                      | 2165                        |
|                            |                             | 1.270                       | 2215                         | 1.270                      | 2173                        |
|                            |                             | 1.275                       | 2223                         | 1.275                      | 2180                        |
|                            |                             | 1.280                       | 2230                         | 1.280                      | 2188                        |
|                            |                             | 1.285                       | 2237                         | 1.285                      | 2195                        |
|                            |                             | 1.290                       | 2245                         | 1.290                      | 2203                        |
|                            |                             | 1.295                       | 2252                         | 1.295                      | 2210                        |
|                            |                             | 1.300                       | 2260                         | 1.300                      | 2218                        |
|                            |                             | 1.305                       | 2267                         | 1.305                      | 2225                        |
|                            |                             | 1.310                       | 2274                         | 1.310                      | 2232                        |
|                            |                             | 1.315                       | 2282                         | 1.315                      | 2240                        |
|                            |                             | 1.320                       | 2289                         | 1.320                      | 2247                        |
|                            |                             | 1.325                       | 2296                         | 1.325                      | 2254                        |
|                            |                             | 1.330                       | 2304                         | 1.330                      | 2262                        |
|                            |                             | 1.335                       | 2311                         | 1.335                      | 2269                        |
|                            |                             | 1.340                       | 2318                         | 1.340                      | 2276                        |
|                            |                             | 1.345                       | 2325                         | 1.345                      | 2283                        |
|                            |                             | 1.350                       | 2332                         | 1.350                      | 2290                        |
|                            |                             | 1.355                       | 2340                         | 1.355                      | 2298                        |
|                            |                             | 1.360                       | 2347                         | 1.360                      | 2305                        |
|                            |                             | 1.365                       | 2354                         | 1.365                      | 2312                        |
|                            |                             | 1.370                       | 2361                         | 1.370                      | 2319                        |
|                            |                             | 1.375                       | 2368                         | 1.375                      | 2326                        |
|                            |                             | 1.380                       | 2375                         | 1.380                      | 2333                        |
|                            |                             | 1.385                       | 2382                         | 1.385                      | 2340                        |
|                            |                             | 1.390                       | 2389                         | 1.390                      | 2347                        |
|                            |                             | 1.395                       | 2396                         | 1.395                      | 2354                        |
|                            |                             | 1.400                       | 2403                         | 1.400                      | 2361                        |
|                            |                             | 1.405                       | 2410                         | 1.405                      | 2368                        |
|                            |                             | 1.410                       | 2417                         | 1.410                      | 2375                        |

A REVIEW OF THE  $V_{50}$  BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 14 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S

PROJECTILE P5: 20 MM API-T M602 @ 30 DEG OBLIQUITY

| REV C<br>THICKNESS<br>[IN] | REV C<br>REQ BL(P)<br>[FPS] | REV C2<br>THICKNESS<br>[IN] | REV C2<br>REQ BL(P)<br>[FPS] | REV D<br>THICKNESS<br>[IN] | REV D<br>REQ BL(P)<br>[FPS] |
|----------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|
|                            |                             | 1.415                       | 2424                         | 1.415                      | 2382                        |
|                            |                             | 1.420                       | 2431                         | 1.420                      | 2389                        |
|                            |                             | 1.425                       | 2438                         | 1.425                      | 2396                        |
|                            |                             | 1.430                       | 2444                         | 1.430                      | 2402                        |
|                            |                             | 1.435                       | 2451                         | 1.435                      | 2409                        |
|                            |                             | 1.440                       | 2458                         | 1.440                      | 2416                        |
|                            |                             | 1.445                       | 2465                         | 1.445                      | 2423                        |
|                            |                             | 1.450                       | 2472                         | 1.450                      | 2430                        |
|                            |                             | 1.455                       | 2478                         | 1.455                      | 2436                        |
|                            |                             | 1.460                       | 2485                         | 1.460                      | 2443                        |
|                            |                             | 1.465                       | 2492                         | 1.465                      | 2450                        |
|                            |                             | 1.470                       | 2499                         | 1.470                      | 2457                        |
|                            |                             | 1.475                       | 2505                         | 1.475                      | 2463                        |
|                            |                             | 1.480                       | 2512                         | 1.480                      | 2470                        |
|                            |                             | 1.485                       | 2519                         | 1.485                      | 2477                        |
|                            |                             | 1.490                       | 2525                         | 1.490                      | 2483                        |
|                            |                             | 1.495                       | 2532                         | 1.495                      | 2490                        |
|                            |                             | 1.500                       | 2538                         | 1.500                      | 2496                        |
|                            |                             | 1.505                       | 2545                         | 1.505                      | 2503                        |
|                            |                             | 1.510                       | 2552                         | 1.510                      | 2510                        |
|                            |                             | 1.515                       | 2558                         | 1.515                      | 2516                        |
|                            |                             | 1.520                       | 2565                         | 1.520                      | 2523                        |
|                            |                             | 1.525                       | 2571                         | 1.525                      | 2529                        |
|                            |                             | 1.530                       | 2578                         | 1.530                      | 2536                        |
|                            |                             | 1.535                       | 2584                         | 1.535                      | 2542                        |
|                            |                             | 1.540                       | 2591                         | 1.540                      | 2549                        |
|                            |                             | 1.545                       | 2597                         | 1.545                      | 2555                        |
|                            |                             | 1.550                       | 2604                         | 1.550                      | 2561                        |
|                            |                             | 1.555                       | 2610                         | 1.555                      | 2568                        |
|                            |                             | 1.560                       | 2616                         | 1.560                      | 2574                        |
|                            |                             | 1.565                       | 2623                         | 1.565                      | 2581                        |
|                            |                             | 1.570                       | 2629                         | 1.570                      | 2587                        |
|                            |                             | 1.575                       | 2636                         | 1.575                      | 2593                        |
|                            |                             | 1.580                       | 2642                         | 1.580                      | 2600                        |
|                            |                             | 1.585                       | 2648                         | 1.585                      | 2606                        |
|                            |                             | 1.590                       | 2655                         | 1.590                      | 2612                        |
|                            |                             | 1.595                       | 2661                         | 1.595                      | 2619                        |
|                            |                             | 1.600                       | 2667                         | 1.600                      | 2625                        |
|                            |                             | 1.605                       | 2673                         | 1.605                      | 2631                        |
|                            |                             | 1.610                       | 2680                         | 1.610                      | 2637                        |

A REVIEW OF THE  $V_{50}$  BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 14 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S

PROJECTILE P5: 20 MM API-T M602 @ 30 DEG OBLIQUITY

| REV C     | REV C     | REV C2    | REV C2    | REV D     | REV D     |
|-----------|-----------|-----------|-----------|-----------|-----------|
| THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) |
| [IN]      | [FPS]     | [IN]      | [FPS]     | [IN]      | [FPS]     |
|           |           | 1.615     | 2686      | 1.615     | 2644      |
|           |           | 1.620     | 2692      | 1.620     | 2650      |
|           |           | 1.625     | 2698      | 1.625     | 2656      |
|           |           | 1.630     | 2705      | 1.630     | 2662      |
|           |           | 1.635     | 2711      | 1.635     | 2669      |
|           |           | 1.640     | 2717      | 1.640     | 2675      |
|           |           | 1.645     | 2723      | 1.645     | 2681      |
|           |           | 1.650     | 2729      | 1.650     | 2687      |
|           |           | 1.655     | 2735      | 1.655     | 2693      |
|           |           | 1.660     | 2742      | 1.660     | 2699      |
|           |           | 1.665     | 2748      | 1.665     | 2705      |
|           |           | 1.670     | 2754      | 1.670     | 2711      |
|           |           | 1.675     | 2760      | 1.675     | 2718      |
|           |           | 1.680     | 2766      | 1.680     | 2724      |
|           |           | 1.685     | 2772      | 1.685     | 2730      |
|           |           | 1.690     | 2778      | 1.690     | 2736      |
|           |           | 1.695     | 2784      | 1.695     | 2742      |
|           |           | 1.700     | 2790      | 1.700     | 2748      |
|           |           | 1.705     | 2796      | 1.705     | 2754      |
|           |           | 1.710     | 2802      | 1.710     | 2760      |
|           |           | 1.715     | 2808      | 1.715     | 2766      |
|           |           | 1.720     | 2814      | 1.720     | 2772      |
|           |           | 1.725     | 2820      | 1.725     | 2778      |
|           |           | 1.730     | 2826      | 1.730     | 2784      |
|           |           | 1.735     | 2832      | 1.735     | 2789      |
|           |           | 1.740     | 2838      | 1.740     | 2795      |
|           |           | 1.745     | 2844      | 1.745     | 2801      |
|           |           | 1.750     | 2850      | 1.750     | 2807      |
|           |           | 1.755     | 2855      | 1.755     | 2813      |
|           |           | 1.760     | 2861      | 1.760     | 2819      |
|           |           | 1.765     | 2867      | 1.765     | 2825      |
|           |           | 1.770     | 2873      | 1.770     | 2831      |
|           |           | 1.775     | 2879      | 1.775     | 2836      |
|           |           | 1.780     | 2885      | 1.780     | 2842      |
|           |           | 1.785     | 2890      | 1.785     | 2848      |
|           |           | 1.790     | 2896      | 1.790     | 2854      |
|           |           | 1.795     | 2902      | 1.795     | 2860      |
|           |           | 1.800     | 2908      | 1.800     | 2865      |
|           |           | 1.805     | 2914      | 1.805     | 2871      |
|           |           | 1.810     | 2919      | 1.810     | 2877      |

# A REVIEW OF THE $V_{50}$ BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 14 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED  $V_{50}$  PROTECTION BALLISTIC LIMITS, BL(P)'S

PROJECTILE P5: 20 MM API-T M602 @ 30 DEG OBLIQUITY

| REV C     | REV C     | REV C2    | REV C2    | REV D     | REV D     |
|-----------|-----------|-----------|-----------|-----------|-----------|
| THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) |
| [IN]      | [FPS]     | [IN]      | [FPS]     | [IN]      | [FPS]     |
|           |           | 1.815     | 2925      | 1.815     | 2883      |
|           |           | 1.820     | 2931      | 1.820     | 2888      |
|           |           | 1.825     | 2937      | 1.825     | 2894      |
|           |           | 1.830     | 2942      | 1.830     | 2900      |
|           |           | 1.835     | 2948      | 1.835     | 2905      |
|           |           | 1.840     | 2954      | 1.840     | 2911      |
|           |           | 1.845     | 2959      | 1.845     | 2917      |
|           |           | 1.850     | 2965      | 1.850     | 2922      |
|           |           | 1.855     | 2971      | 1.855     | 2928      |
|           |           | 1.860     | 2976      | 1.860     | 2934      |
|           |           | 1.865     | 2982      | 1.865     | 2939      |
|           |           | 1.870     | 2988      | 1.870     | 2945      |
|           |           | 1.875     | 2993      | 1.875     | 2951      |
|           |           | 1.880     | 2999      | 1.880     | 2956      |
|           |           | 1.885     | 3004      | 1.885     | 2962      |
|           |           | 1.890     | 3010      | 1.890     | 2967      |
|           |           | 1.895     | 3016      | 1.895     | 2973      |
|           |           | 1.900     | 3021      | 1.900     | 2978      |
|           |           | 1.905     | 3027      | 1.905     | 2984      |
|           |           | 1.910     | 3032      | 1.910     | 2990      |
|           |           | 1.915     | 3038      | 1.915     | 2995      |
|           |           | 1.920     | 3043      | 1.920     | 3001      |
|           |           | 1.925     | 3049      | 1.925     | 3006      |
|           |           | 1.930     | 3054      | 1.930     | 3012      |
|           |           | 1.935     | 3060      | 1.935     | 3017      |
|           |           | 1.940     | 3065      | 1.940     | 3023      |
|           |           | 1.945     | 3071      | 1.945     | 3028      |
|           |           | 1.950     | 3076      | 1.950     | 3033      |
|           |           | 1.955     | 3082      | 1.955     | 3039      |
|           |           | 1.960     | 3087      | 1.960     | 3044      |
|           |           | 1.965     | 3093      | 1.965     | 3050      |
|           |           | 1.970     | 3098      | 1.970     | 3055      |
|           |           | 1.975     | 3103      | 1.975     | 3061      |
|           |           | 1.980     | 3109      | 1.980     | 3066      |
|           |           | 1.985     | 3114      | 1.985     | 3071      |
|           |           | 1.990     | 3120      | 1.990     | 3077      |
|           |           | 1.995     | 3125      | 1.995     | 3082      |
|           |           | 2.000     | 3130      | 2.000     | 3088      |
|           |           | 2.005     | 3136      | 2.005     | 3093      |
|           |           | 2.010     | 3141      | 2.010     | 3098      |

# A REVIEW OF THE V<sub>50</sub> BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 14 (CONTINUED)

MIL SPEC MIL-A-46100

MINIMUM REQUIRED V<sub>50</sub> PROTECTION BALLISTIC LIMITS, BL(P)'S  
PROJECTILE P5: 20 MM API-T M602 @ 30 DEG OBLIQUITY

| REV C     | REV C     | REV C2    | REV C2    | REV D     | REV D     |
|-----------|-----------|-----------|-----------|-----------|-----------|
| THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) | THICKNESS | REQ BL(P) |
| [IN]      | [FPS]     | [IN]      | [FPS]     | [IN]      | [FPS]     |
|           |           | 2.015     | 3146      | 2.015     | 3104      |
|           |           | 2.020     | 3152      | 2.020     | 3109      |
|           |           | 2.025     | 3157      | 2.025     | 3114      |
|           |           | 2.030     | 3162      | 2.030     | 3120      |
|           |           | 2.035     | 3168      | 2.035     | 3125      |
|           |           | 2.040     | 3173      | 2.040     | 3130      |
|           |           | 2.045     | 3178      | 2.045     | 3135      |
|           |           | 2.050     | 3184      | 2.050     | 3141      |
|           |           | 2.055     | 3189      | 2.055     | 3146      |
|           |           | 2.060     | 3194      | 2.060     | 3151      |
|           |           | 2.065     | 3199      | 2.065     | 3156      |
|           |           | 2.070     | 3205      | 2.070     | 3162      |
|           |           | 2.075     | 3210      | 2.075     | 3167      |
|           |           | 2.080     | 3215      | 2.080     | 3172      |
|           |           | 2.085     | 3220      | 2.085     | 3177      |
|           |           | 2.090     | 3226      | 2.090     | 3183      |
|           |           | 2.095     | 3231      | 2.095     | 3188      |
|           |           | 2.100     | 3236      | 2.100     | 3193      |
|           |           | 2.105     | 3241      | 2.105     | 3198      |
|           |           | 2.110     | 3246      | 2.110     | 3203      |
|           |           | 2.115     | 3252      | 2.115     | 3208      |
|           |           | 2.120     | 3257      | 2.120     | 3214      |
|           |           | 2.125     | 3262      | 2.125     | 3219      |
|           |           | 2.130     | 3267      | 2.130     | 3224      |
|           |           | 2.135     | 3272      | 2.135     | 3229      |
|           |           | 2.140     | 3277      | 2.140     | 3234      |
|           |           | 2.145     | 3282      | 2.145     | 3239      |
|           |           | 2.150     | 3288      | 2.150     | 3244      |
|           |           | 2.155     | 3293      | 2.155     | 3250      |
|           |           | 2.160     | 3298      | 2.160     | 3255      |
|           |           | 2.165     | 3303      | 2.165     | 3260      |
|           |           | 2.170     | 3308      | 2.170     | 3265      |
|           |           | 2.175     | 3313      | 2.175     | 3270      |

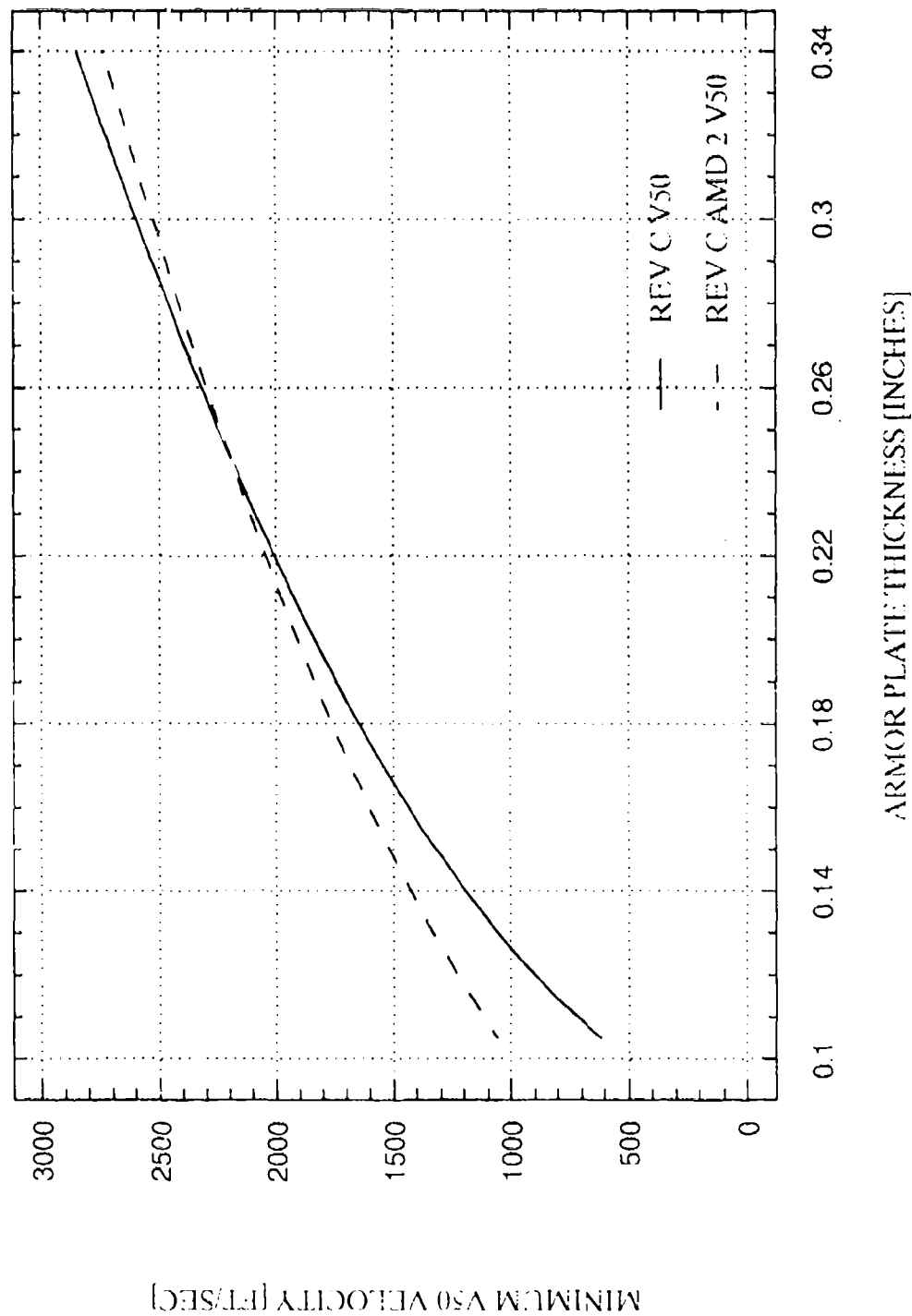
A REVIEW OF THE  $V_{50}$  BALLISTIC TEST REQUIREMENTS OF MIL-A-46100

TABLE 15

| MIL-A-46100 TABLE SIZES FOR TABLES OF<br>MINIMUM REQUIRED BALLISTIC LIMITS |       |       |
|----------------------------------------------------------------------------|-------|-------|
| PROJECTILE                                                                 | TABLE | PAGES |
| CAL 0.30 AP M2                                                             | 10    | 2     |
| CAL 0.50 AP M2                                                             | 11    | 2     |
| 14.5 MM API B32                                                            | 12    | 2     |
| 14.5 MM API BS41                                                           | 13    | 2     |
| 20 MM API-T M602                                                           | 14    | 6     |

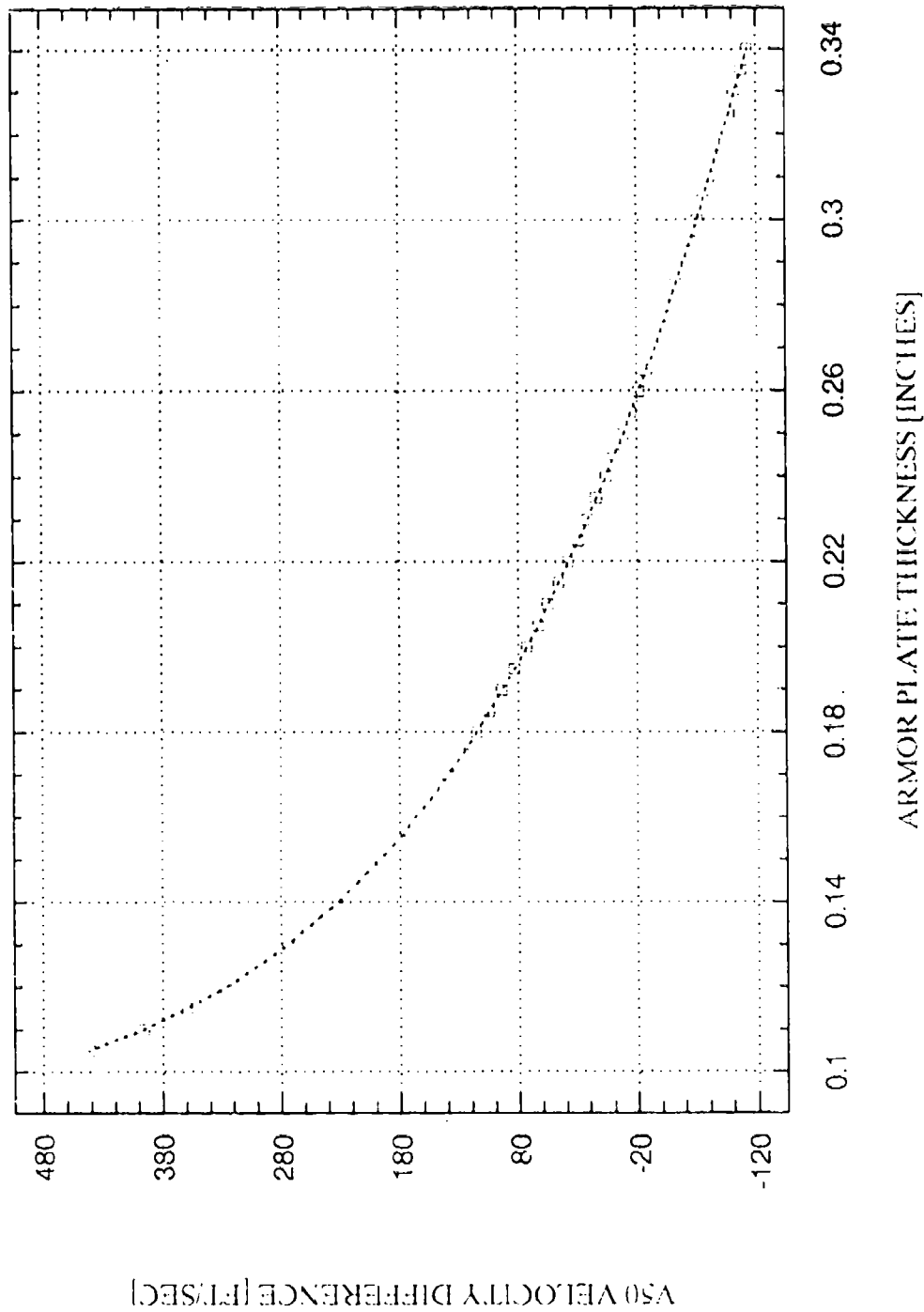
# MIL-A-46100 REV C & REV C AMD 2

PROJECTILE: 0.30 CAL AP M2 @ 30 DEG



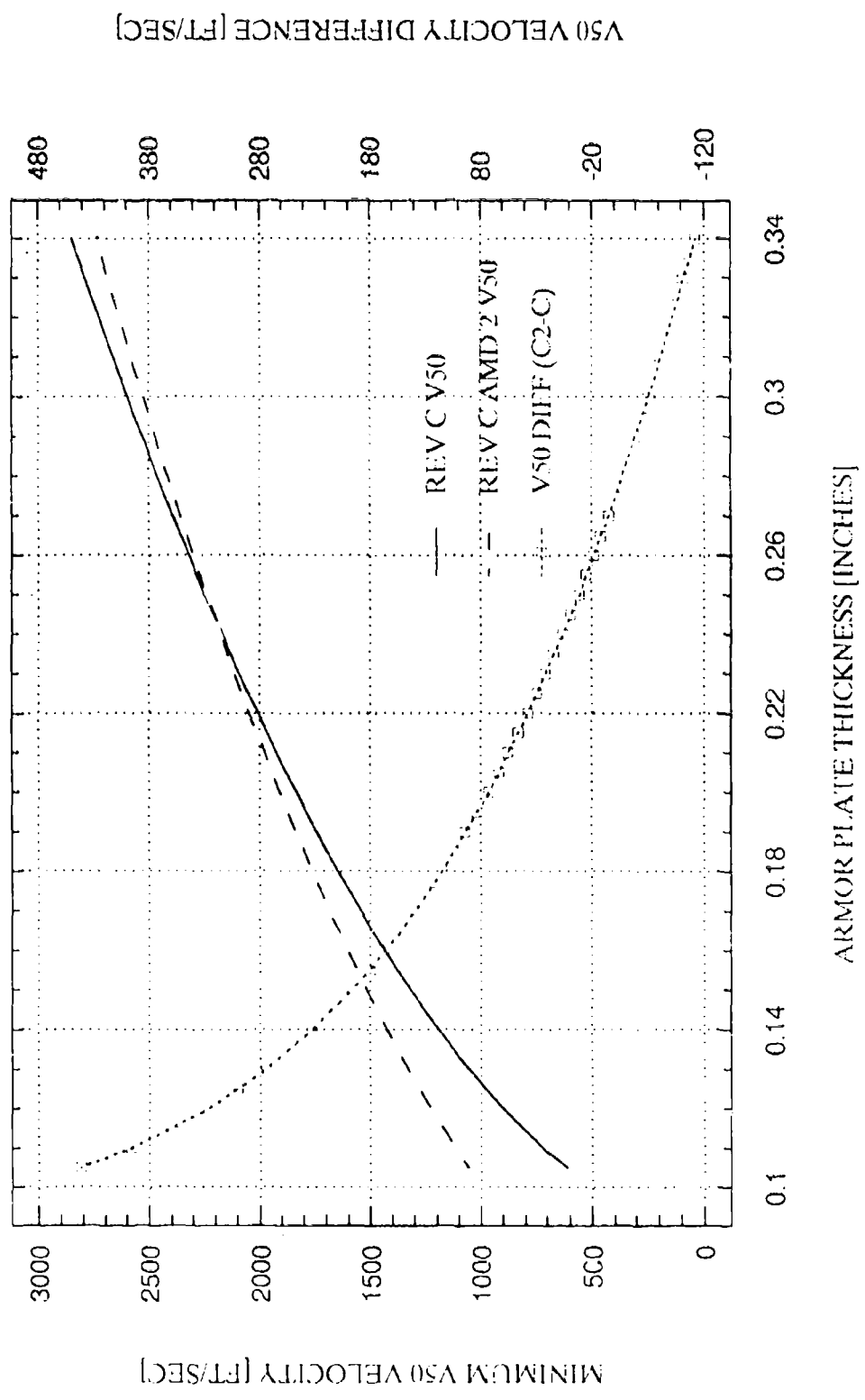
# MIL-A-46100 REV C & REV C AMD2

PROJECTILE: 0.30 CAL AP M2 @ 30 DEG



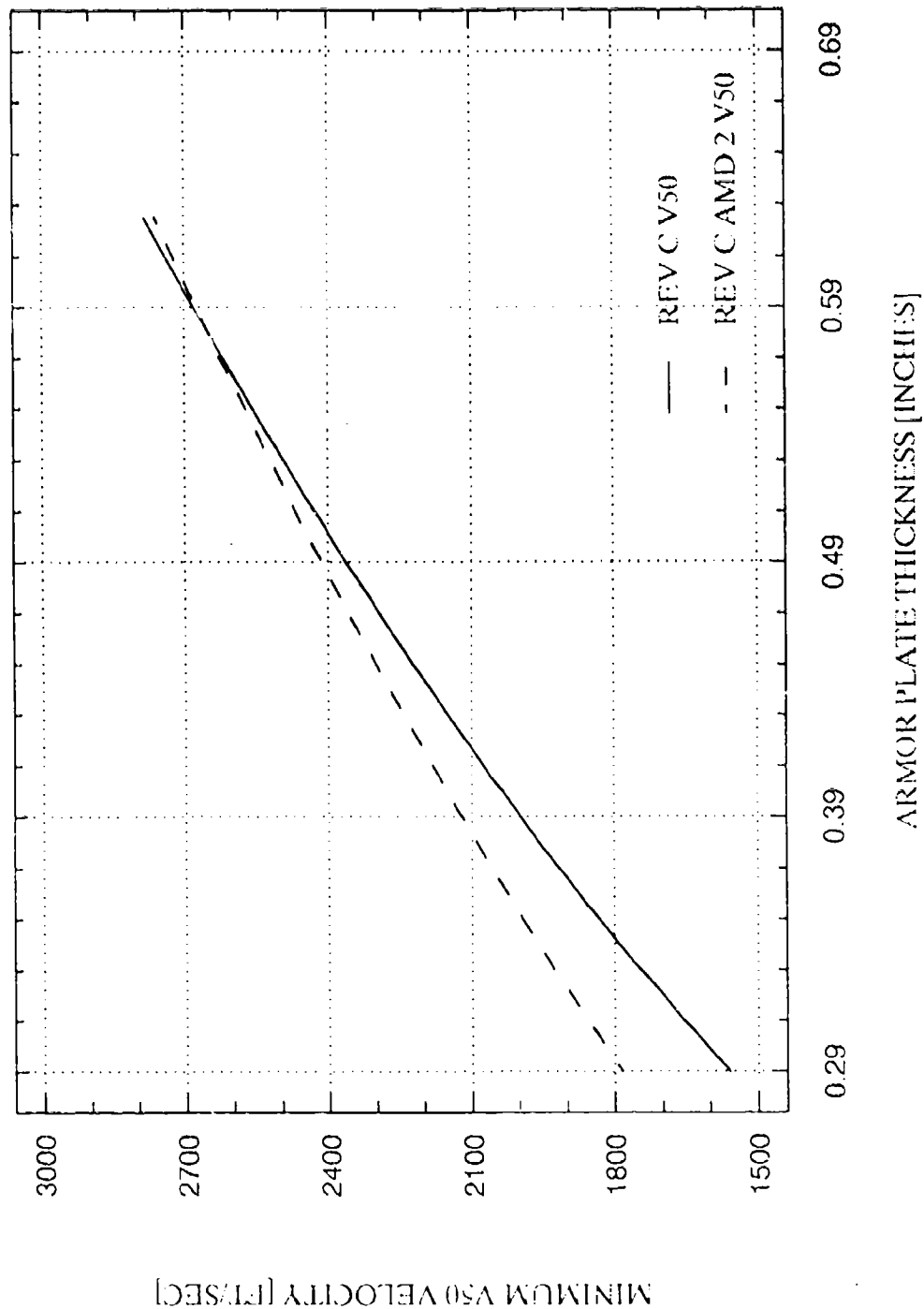
# MIL-A-46100 REV C & REV C AMD2

PROJECTILE: 0.30 CAL AP M2 @ 30 DEG



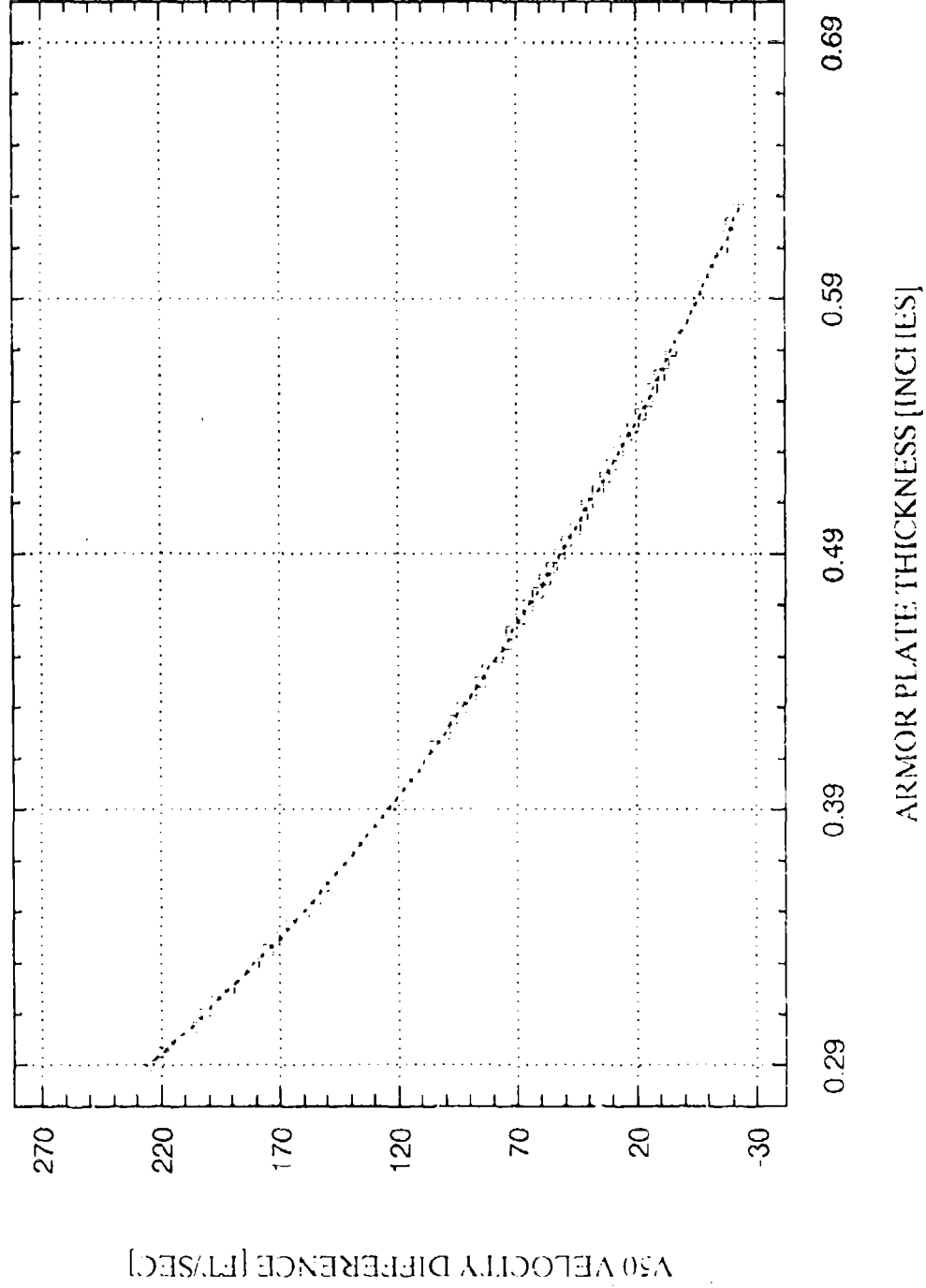
# MIL-A-46100 REV C & REV C AMD 2

PROJECTILE: 0.50 CAL AP M2 @ 30 DEG



# MIL-A-46100 REV C & REV C AMD2

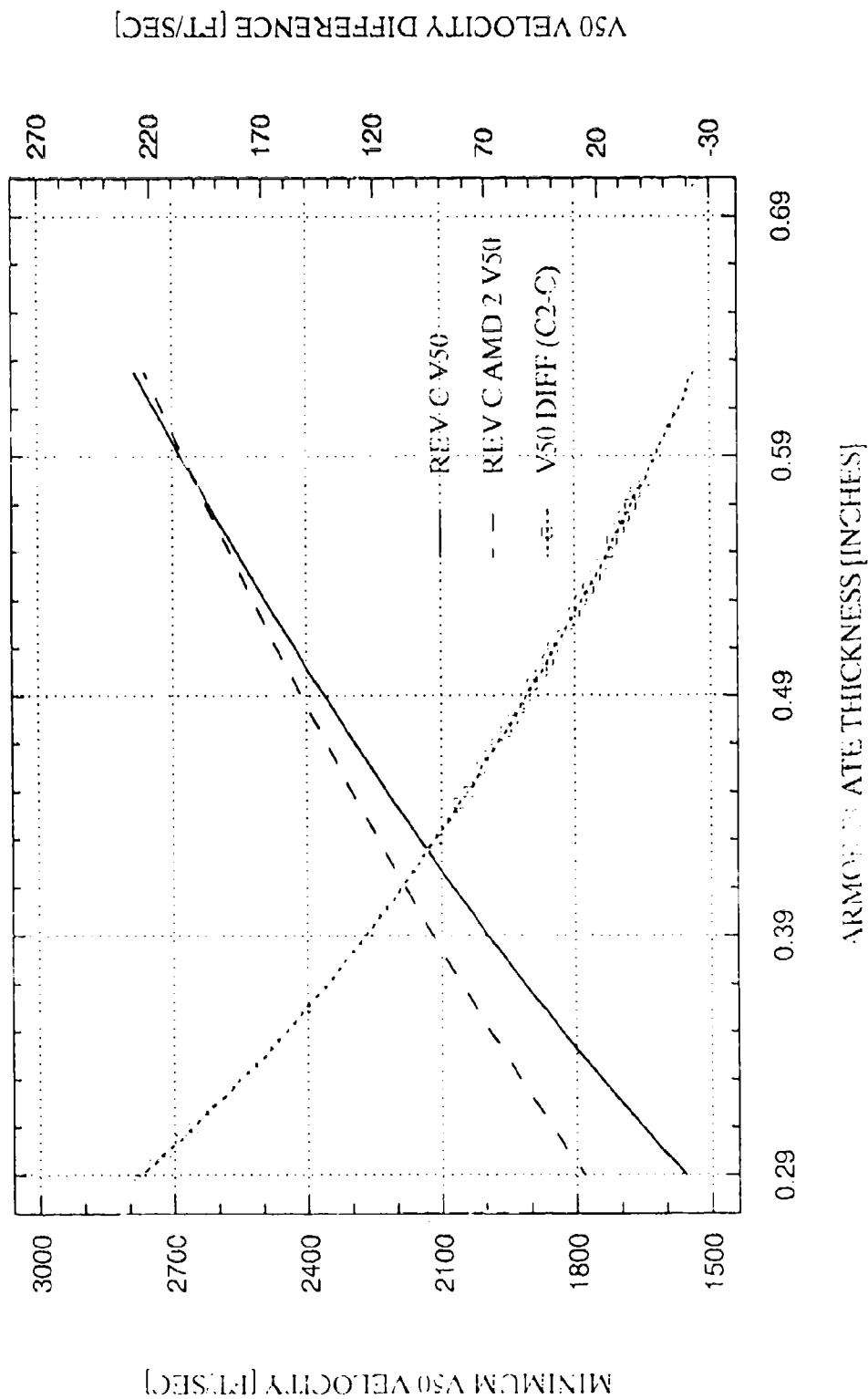
PROJECTILE: 0.50 CAL AP M2 @ 30 DEG



V50 DIFF (C2-C)

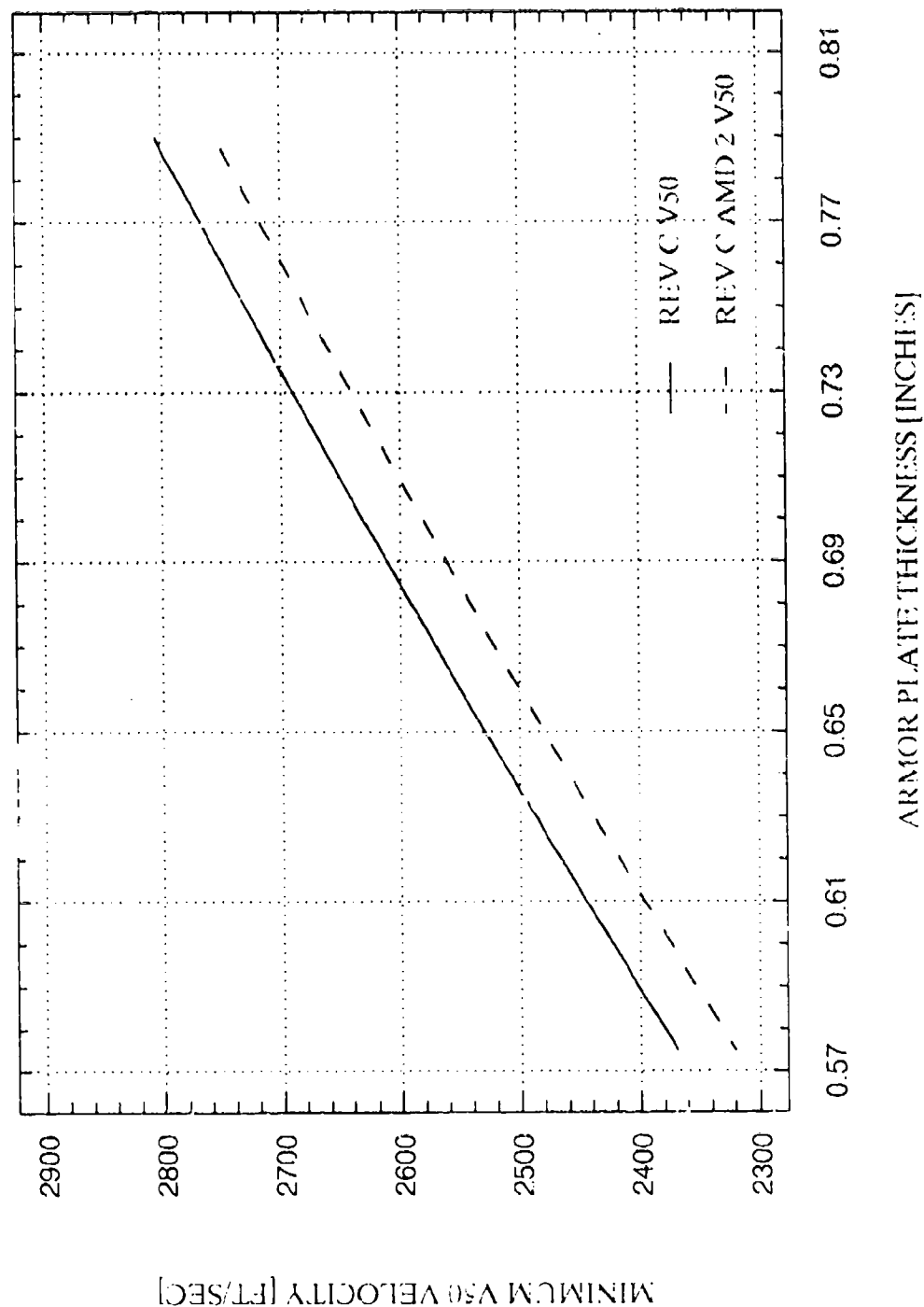
# MIL-A-46100 REV C & REV C AMD2

PROJECTILE: 0.50 CAL AP M2 @ 30 DEG



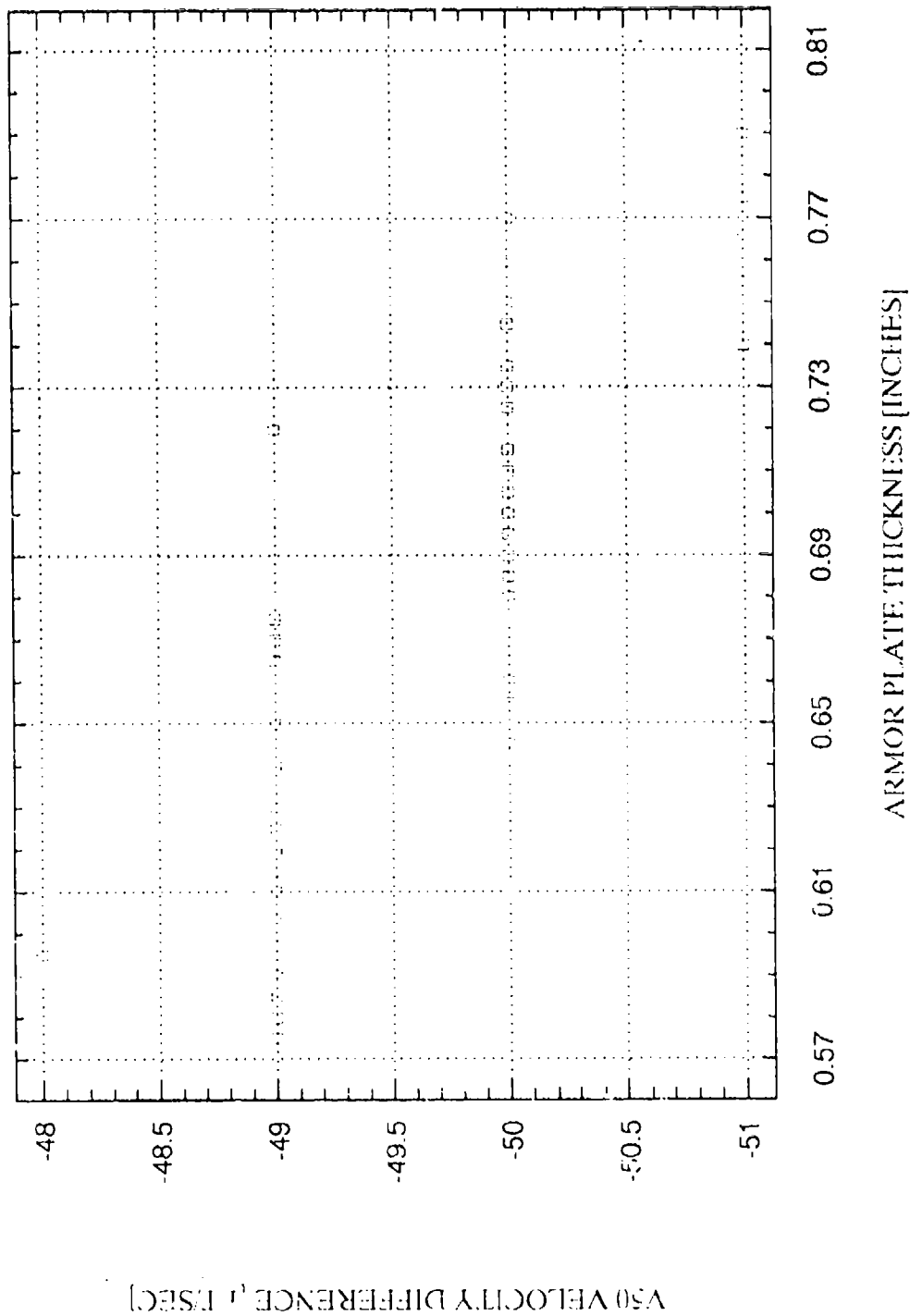
# MIL-A-46100 REV C & REV C AMD 2

PROJECTILE: 14.5 MM API B32 @ 30 DEG



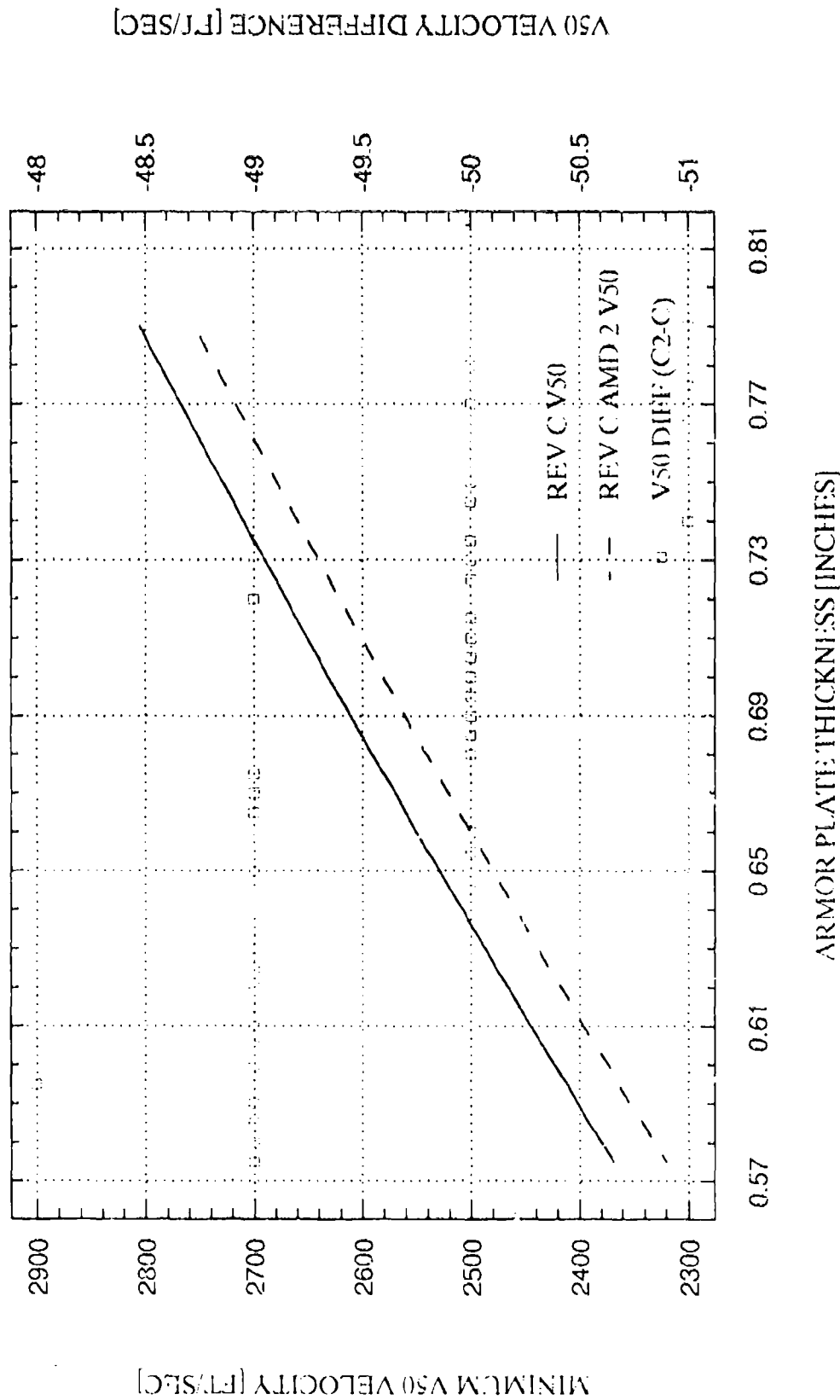
# MIL-A-46100 REV C & REV C AMD 2

PROJECTILE: 14.5 MM API B32 @ 30 DEG



# MIL-A-46100 REV C & REV C AMD 2

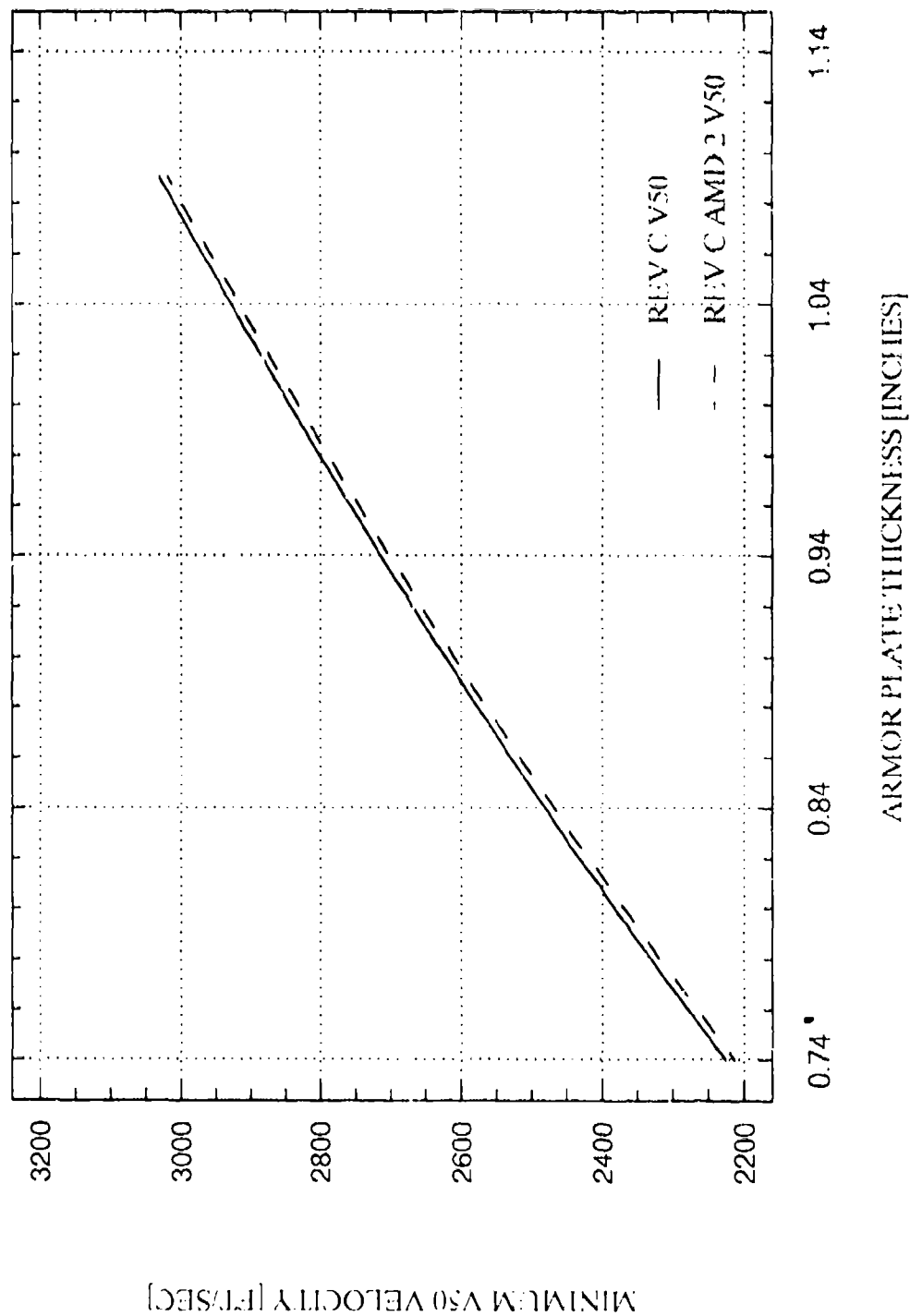
PROJECTILE: 14.5 MM API B32 @ 30 DEG



AVG V50 DIFF = -50 FT/SEC

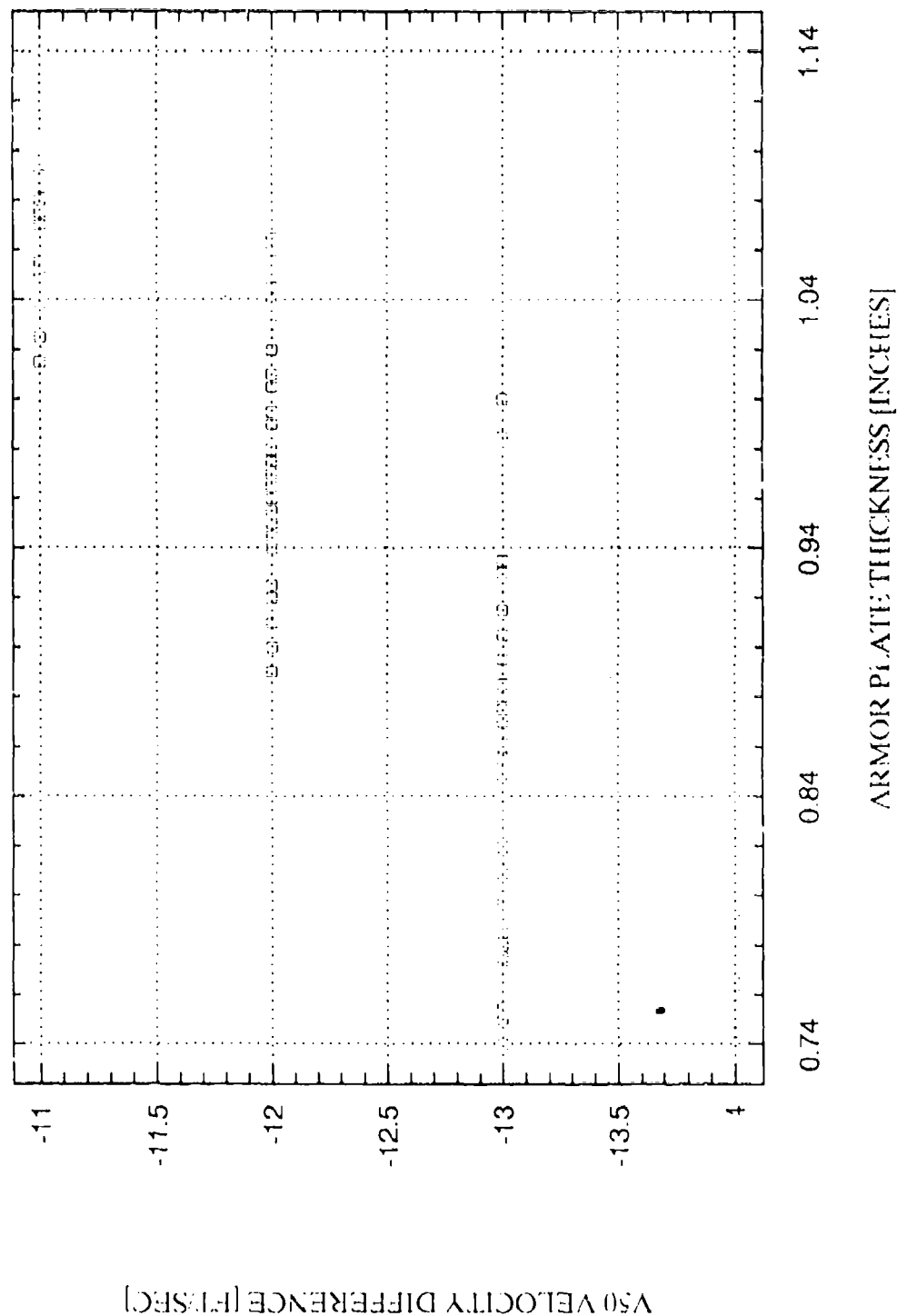
# MIL-A-46100 REV C & REV C AMD 2

PROJECTILE: 14.5 MM API BS41 @ 30 DEG



# MIL-A-46100 REV C & REV C AMD 2

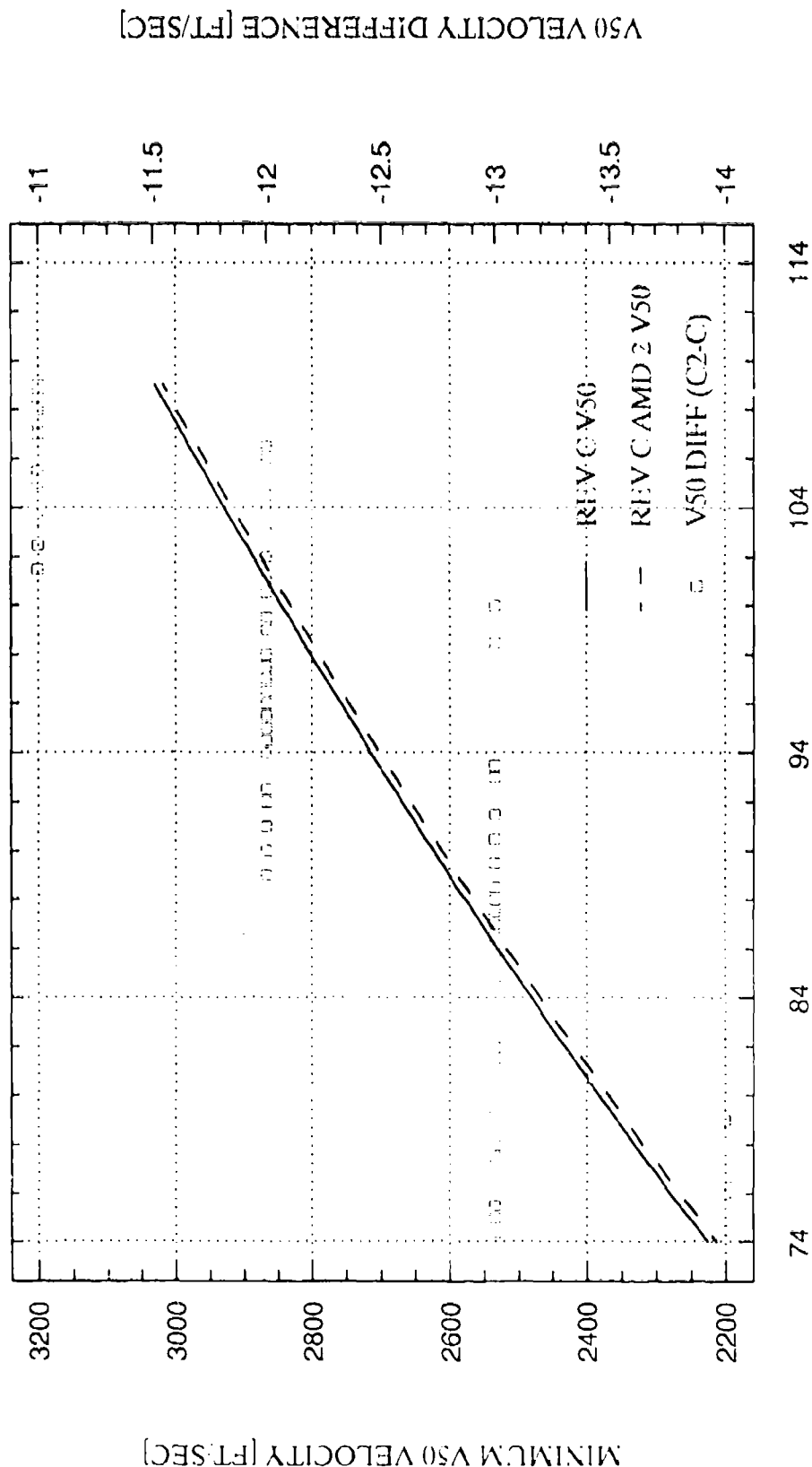
PROJECTILE: 14.5 MM API BS41 @ 30 DEG



V50 DIFF (C2-C): AVG V50 DIFF = -12 FT/SEC

# MIL-A-46100 REV C & REV C AMD 2

PROJECTILE: 14.5 MM API BS41 @ 30 DEG

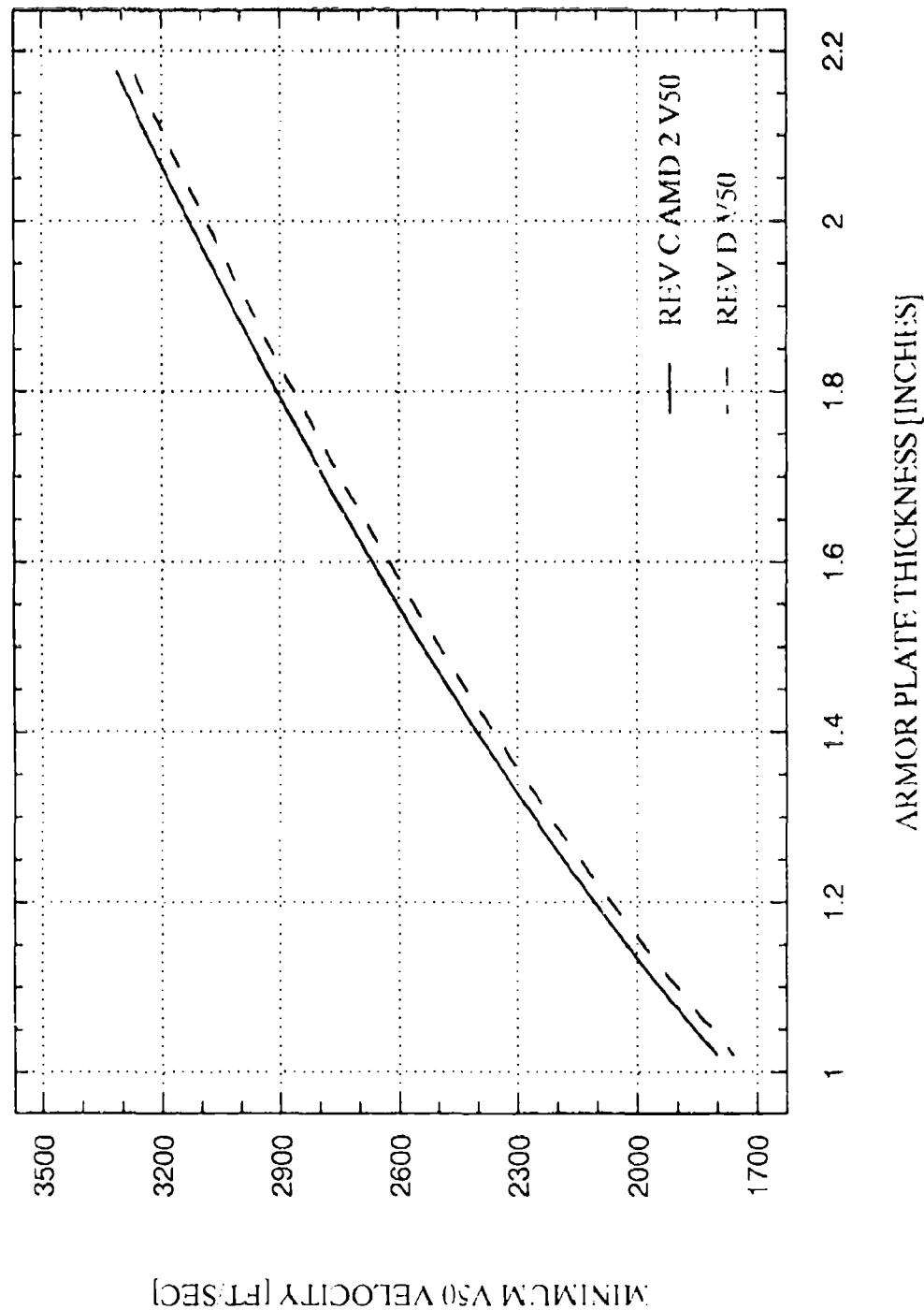


ARMOR PLATE THICKNESS [INCHES] (X 0.01)

AVG V50 DIFF = -12 FT/SEC

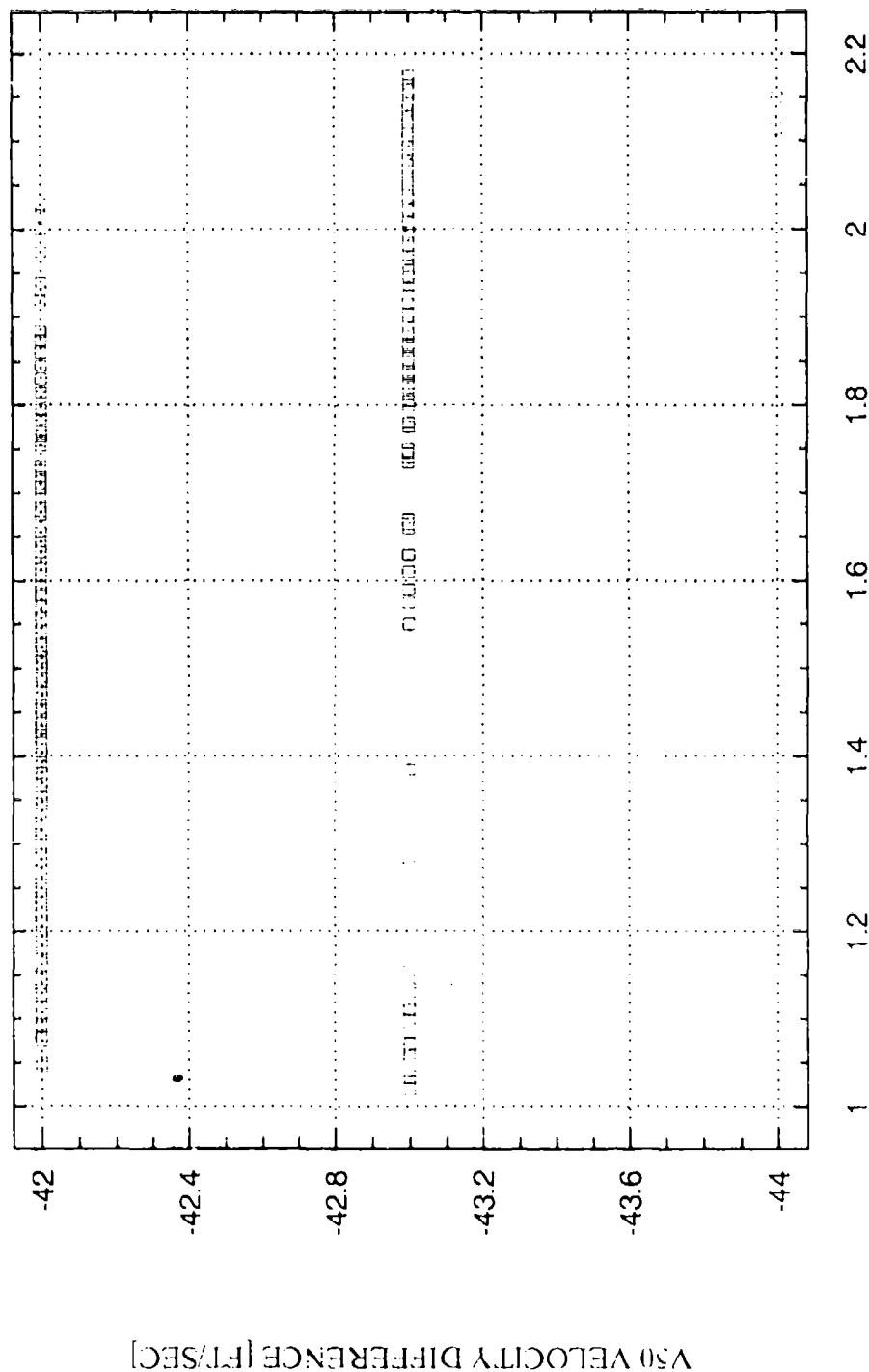
# MIL-A-46100 REV C AMD 2 & REV D

PROJECTILE: 20 MM API-T M602 @ 0 DEG



# MIL-A-46100 REV C AMD 2 & REV D

PROJECTILE: 20 MM API-T M602 @ 30 DEG

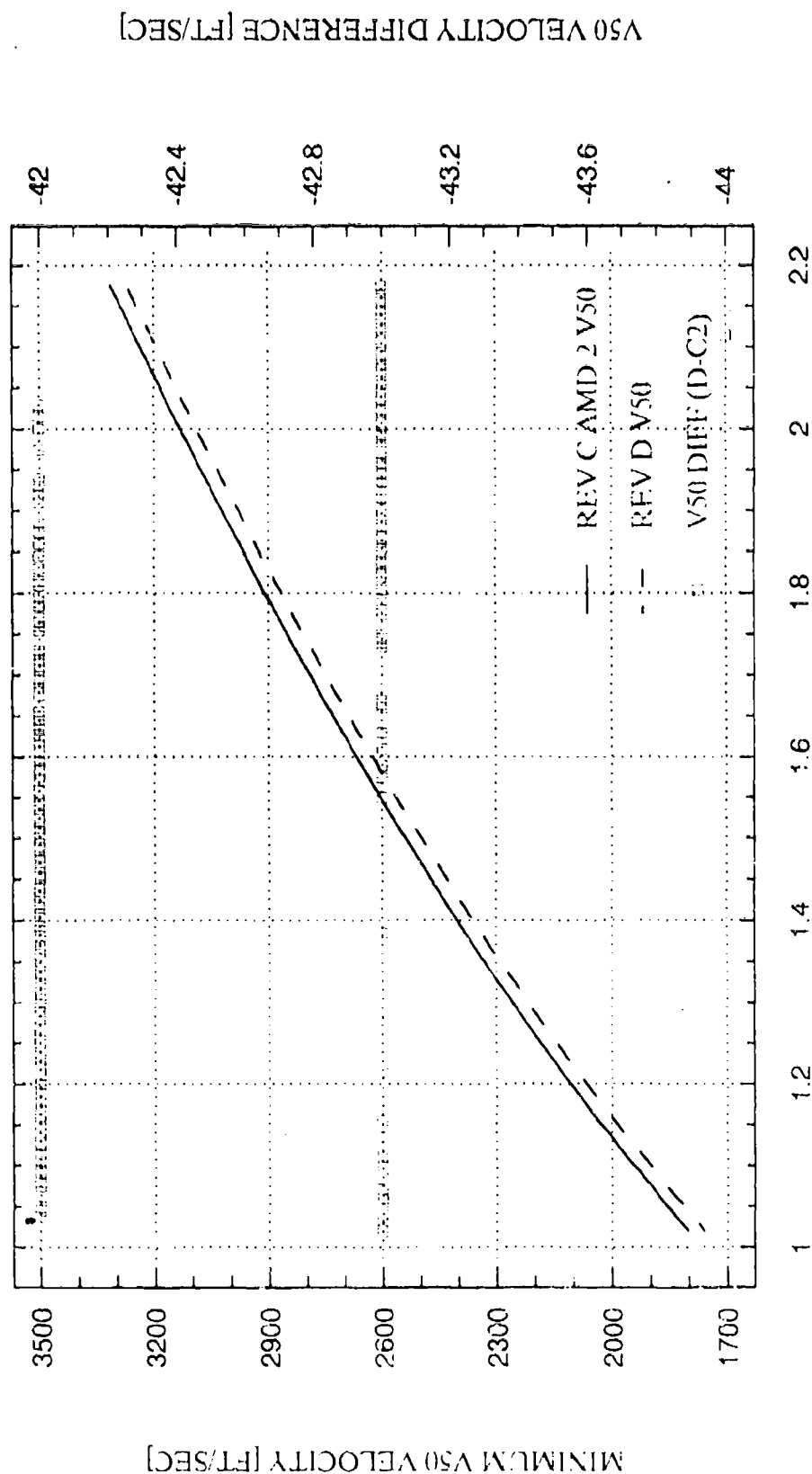


ARMOR PLATE THICKNESS [INCHES]

V50 DIFF (D-C2); AVG V50 DIFF = -42 FT/SEC

# MIL-A-46100 REV C AMD 2 & REV D

PROJECTILE: 20 MM API-T M602 @ 30 DEG



ARMOR PLATE THICKNESS [INCHES]

AVG V50 DIFF = -42 FT/SEC

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